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NAVAL POSTGRADUATE SCHOOL

Monterey, California

PLAYER'S MANUAL OF RULES AND PROCEDURES

FOR THE HALF-SAFE SIMULATION

OF STRATEGIC PLANNING AND NUCLEAR WAR

David P. Burke

February 1980

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This report embodies the rules and procedures of the Half-SAFE game, a man-manual simulation of nine years of planning, procurement and use of strategic nuclear weapons systems, offensive and defensive. The game also simulates the operation of associated intelligence and command and control systems. It is intended as a heuristic teaching device for use at the advanced university level. The game is the result of research and testing at the Air Force Academy, Harvard University, the Massachusetts Institute of Technology and the Naval Postgraduate School from 1965 to 1980.

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1. INTRODUCTION

1.1 This Manual

This Players' Manual has two main purposes: it serves as a pre-game introduction to Half-SAFE, and it serves as a reference manual of rules and procedures for use during the game. You have been given this manual to read before you and your fellow players meet to begin the game. You will spare yourself a great deal of frustration if you read it carefully now and make notes on those sections that you find confusing, inconsistent or inadequately explained. Before you begin to play the game you and your fellow players will join the Game Director and his staff for a briefing. At the briefing you will be expected to point out any apparent errors or inadequacies of explanation you have found in this manual. The Game Director will try to clarify the passages, or he will ask you to make corrections to this manual which he will include in later revisions of the game. In short, a careful reading of this manual now is insurance against irremedial errors which you might otherwise make when you play Half-SAFE and a contribution to the improvement of the game for those who play it after you.

1.2 Purpose and Limitations of the Game

The goal of Half-SAFE is not to be a perfect mirror of reality. But the game is sufficiently realistic to enable you to supplement your theoretical knowledge of defense policy-making with a taste of what decision-

making in the national security field is like. The game also gives you a chance to perform comparative analyses of the performance of competing weapons systems. The environment in which you make your decisions and construct your analyses, however, is a radical simplification of the real world. Limited war forces are not involved; you will deal only with strategic offensive and defensive forces and their associated intelligence and command-and-control systems. Also, players assume the role of decision-makers of two thermonuclear powers with the geography, resources and populations of the United States and the Soviet Union. The actions of other states are simulated by the Game Director, if they are simulated at all. And, of course, time in the game is greatly compressed. You will "live through" nine years of game time in a few days of play. However, despite these simplifications, you will probably find the game demanding. Most of those who played earlier versions of Half-SAFE have complained that they did not have sufficient time to master all of the niggling details of the simulated environment, not that the environment was too simple. But in the real world of strategic planning, decision-makers complain of the same pressures of time and frustration with details. You too may finish the game feeling somewhat frustrated, confounded or even cheated, but if the game also leaves you with some insights into the problems faced by real-world decision-makers who must act in the face of uncertainty of their opponents' intentions and of implacable deadlines for decision, Half-SAFE will have done its job.

2. GENERAL DESCRIPTION

2.1 Teams and Communication Between Them

Half-SAFE[1] is played by two teams of from four to ten persons each. Once play begins the teams are isolated in separate rooms and communicate with one another only by notes passed between them by the Game Director or in meetings between delegates of each team which take place in the presence of the Game Director or other members of the directing staff. It is essential that the game not be discussed by players from opposing teams outside the control of the directing staff. If this rule is broken the entire simulation tends to break down. The directing staff may at any time refuse to pass a note between teams without stating a reason. Similarly, inter-team meetings may be denied at any time. These apparently arbitrary denials of communication usually result from the pressure of time or from the Game Director's perception of developments that seem likely to lead to situations that cannot be handled within the limits of the rules.

2.2 The Point of the Game

Half-SAFE is designed to provide a heuristic learning situation, a situation in which the players learn something about strategic decision-making by exposure to experience rather than by understanding produced by analysis. Ideally, the game is a supplement to analytic understanding as well as a framework in which fairly sophisticated models and analyses may

---

1. Half-SAFE is so named because it is derived from the SAFE (Strategy and Force Evaluation) game developed by Olaf Helmer and R.E. Bickner of the RAND Corporation in the late 1950s and early 1960s. For an early version see Helmer and Bickner, How to Play SAFE: Book of Rules of the Strategy and Force Evaluation Game, RAND RM. - 2865- PR, November 1961.

be employed by players skilled in their construction and use. But the main goal of the game is to provide an experience that approximates that of high-level national decison-makers in the formulation and execution of national security policy.

The provision of such an experience is more important than the mechanical determination of winner and loser. After all, in the real world it may be impossible at any moment to declare who has "won" or "lost" the continuing confrontation of major powers whose interests conflict in part but seldom conflict in their entirety. If nothing else, thermo-nuclear powers share an interest in not allowing the pursuit of their conflicting goals to lead to mutual destruction of their societies. Similarly, you may find that neither team can emerge from your particular game as a clearcut winner.

However, at the beginning of play your team and your opponents will be given an opportunity to set out your strategic goals in the light of what each expects the other might do as the game progresses. You will be given periodic opportunities to reassess your opponents' capabilities and intentions and to revise your strategic goals and contingency plans to correspond to the changed situation as you see it. At the end of the game both teams will meet for a "post-mortem" discussion of the game. At this time your performance will be evaluated in terms of how well your team assessed the strategic situation, the realism and attainability of the goals you set for yourselves, the appropriateness of your actions in pursuit of those goals, and how close you came to achieving them. If the game is played as part of an academic course, you may be given a grade on the basis of this analysis.

2.3 Game Time and Real Time: The Schedule of Play

Half-SAFE begins with a pre-game briefing to familiarize the players with game rules and the playing conditions peculiar to the circumstances of your particular game. The game embraces nine years of "game" time, which, for purposes of illustration in this manual is assumed to begin on January 1 of the year following the beginning of play. This span of time is divided into three three-year planning periods (PP-1, game years 1-3; PP-2, game years 4-6; PP-3, game years 7-9) and a crisis.

Each of the planning periods corresponds to a single "move" in the game. That is, at the end of each period each team reports its decisions to the Game Director, and the Game Director (by hand or using computer programs written for the purpose) determines the results of the interaction of the decisions made by each team and reports the results to them. Armed with this information, the two teams then begin their planning for the next period, make their decisions, and again report them to the Game Director at the planning period's end.

The amount of "real" time which you and your fellow players are given to complete the tasks involved in each planning period will vary with the situation in which your game is played. The Game Director will give you a schedule of play tailored to the requirements of your particular game. However, you can expect to have at least four hours per planning period in which your team can meet as a group for discussion, analysis, decision and the preparation of the reports (and possibly punch-card transcripts) in which your decisions are recorded. The usual playing schedule allows more time for the first planning period than the others to enable players to

familiarize themselves with the rules and the routine tasks involved in the game. The Game Director will always be present for at least the first two hours of each planning period to supervise communications between the teams, to interpret rules and to monitor discussions to prevent inadvertant rule violations. During the second half of the planning period, when much of your time is devoted to recording the results of your decisions, the Game Director and his assistants may not be present. Normally you are free to conduct discussions with the members of your team outside the time set aside for formal team meetings, and individual team members may use as much time as they like for the preparation of analyses and studies for the use of their teams.

The three planning periods constitute the planning phase of Half-SAFE. At their conclusion the crisis phase begins. At the first meeting of the crisis phase the Game Director will introduce a crisis designed to put the strategies, force structures and deployments adopted by the two teams to the most severe test he can concoct. To prevent your team or your opponents' from optimizing its strategy for a crisis at a single predictable point in time, the Game Director may decide that the crisis will occur at the end of the second or third planning period (that is, at the end of the sixth or ninth game year). He will not announce his decision until the planning phase has begun. If he chooses to introduce a crisis which occurs at the end of the second planning period, he will give you time to refresh your memory regarding the status of the game at that time.

The crisis phase may or may not conclude with a nuclear exchange. If it does not, the Game Director will call a halt to play when he decides that you and your opponents have weathered the test and resolved matters to such

an extent that play has reached the point of diminishing educational returns. However, when no nuclear exchange develops naturally in the course of the crisis, the Game Director may decide that it would be useful to discover what the results of a nuclear war between the teams would have been. In that case, as in the case of a nuclear war that develops naturally, each team selects one of its war plans for execution. Detailed strike orders corresponding to the selected plans are then recorded on punch-card transcripts and used as input data for a computer program which simulates the execution of the plans. The results in terms of damage and casualty reports are then available for the post-mortem discussion which concludes the game.

2.4 Teams and Their Resources

The two teams are called Red and Blue. The Red team works with the geography and population of the Soviet Union as its home country, the Blue team with those of the United States. Each team "inherits" extensive military forces, command and control systems and intelligence systems at the beginning of the game. Each team also begins the game with intelligence on the character and deployment of the opposing team's forces, the quality and quantity of this intelligence depending on the character and distribution of the team's inherited intelligence systems.

At the beginning of each planning period your team will be given its budget for the three years involved. The normal base budget figure for each team is fifteen billion dollars, but the base figure may be varied by the Game Director to reflect political developments in the course of the game (for example, arms control agreements). To prevent players from enjoying an absolutely predictable budget, the Game Director subjects the base budget

figure to a random adjustment up or down based on the roll of dice or some other method of generating a random number. The normal range of random budgetary adjustment is plus or minus 400 million dollars.

The budget must cover all expenditures for the team in each planning period. Expenditures are incurred for research and development programs, procurement costs, and the operating costs of weapons, command and control and intelligence systems.

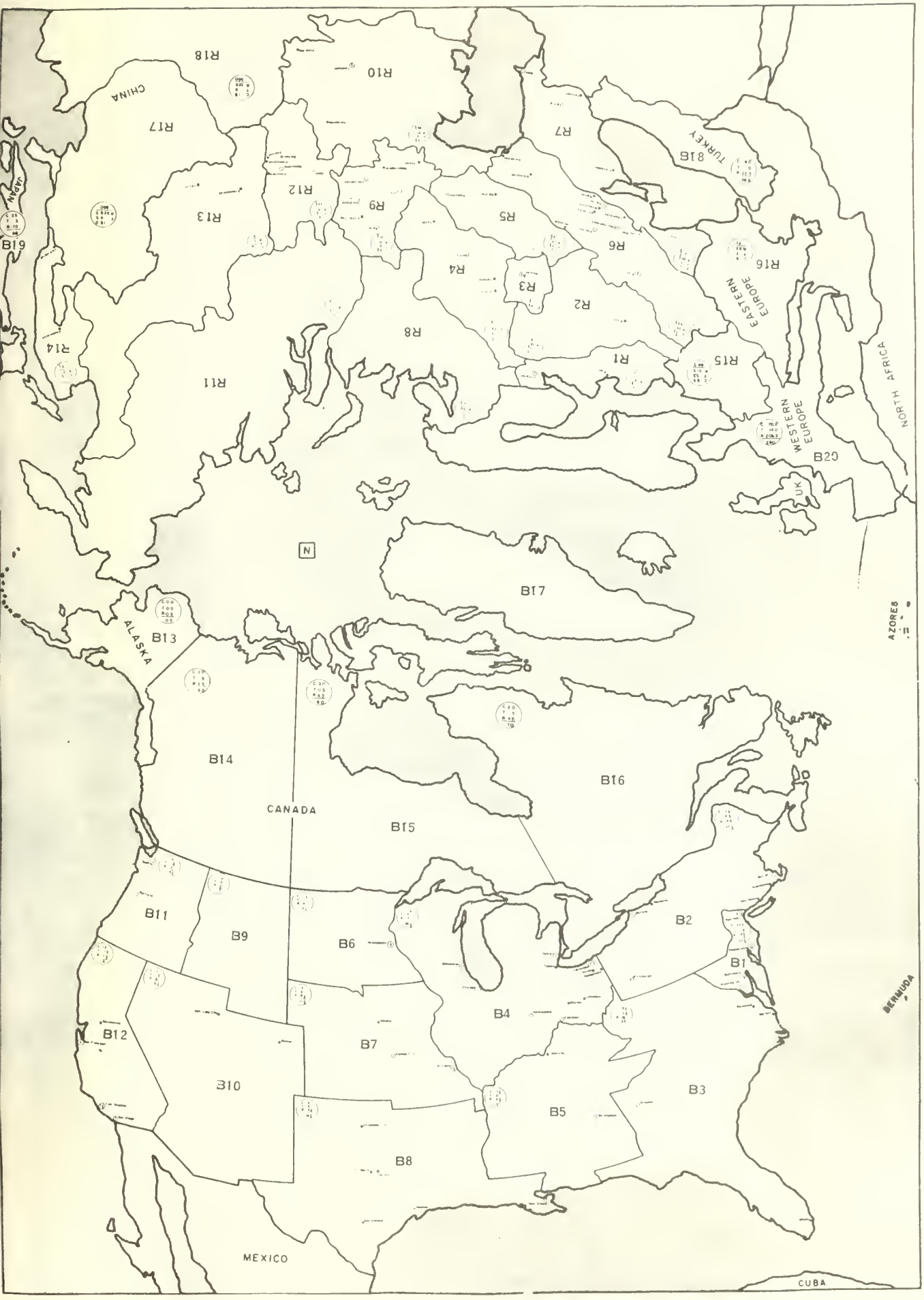
2.5 Game Materials

In addition to this manual, which includes information that is common to both teams, your team will receive a loose-leaf Team Book which will contain the specifications of your weapons systems, certain report forms which your team must complete during the planning phase and other information which would be classified in the real world.

Figure 2.1 is a map of the Northern Hemisphere divided into zones labelled with their Half-SAFE zone numbers. Your team may make a larger copy which you can mark in any way you like to help you visualize the deployment of your forces and those of your opponents. However, keeping a posted map up to date takes a great deal of time. Many teams find it easier to refer to written lists and make visual cross-reference to the map in this manual. The population of each zone and its distribution between towns, cities and rural areas is shown in the Appendix to this manual.

At the beginning of the planning period your team will receive a list of your own forces and those of the opposing team. In computer-assisted games the format of these lists will vary depending on the computer programs and

FIGURE 2.1
HALF-SAFE MAP



facilities available to the directing staff. Your Game Director will familiarize you with the format of the listings at the pre-game briefing or in a supplement to this manual.

The directing staff also maintains a supply of the forms you will need to report your decisions in the course of the game. These forms are of two types: written reports and punch-card transcripts (the latter for computer-assisted games only). The written report forms will be described at appropriate points in this manual and in your Team Book. The punch-card transcripts, like the computer listings mentioned above, must be adapted by the directing staff to the requirements of their computer programs and equipment. As with the listings, the Game Director will explain the format of the punch-card transcripts in a supplement to this manual or at the pre-game briefing.

2.6 Political Simulation

Unless the Game Director rules otherwise, Red and Blue are not required to model their policies on those of the U.S. and U.S.S.R., nor are they expected to adopt policies consistent with Soviet or American ideology.

At the beginning of the game the Game Director will give each team a report summarizing the relations of Red and Blue, their allies (if any) and other states in the years preceding the beginning of the first planning period. You can expect this summary to include a variety of situations which reflect conflicting interests of the two powers in those years. It may also provide clues to situations that might degenerate into a Red-Blue crisis in the nine-year span of the game.

As the game progresses the Game Director will supplement whatever message traffic develops between Red and Blue with simulated intelligence reports, press bulletins and declarations by third powers which reflect the continuing development of the political situation. This aspect of the game is entirely "free" in the sense that it is not governed by rigid rules. The Game Director is limited in his simulation of political developments only by his own imagination, his desire to keep the game from degenerating into the absurd, and his desire to present the players with an adequately challenging political environment. He will, of course, adjust the political information he generates to correspond to the political interplay between the two teams. This interplay consists of message traffic from one team to another, negotiations on arms control agreements and other matters, and the political "signaling" implicit in decisions regarding procurement, deactivation, modification and deployment of forces.

The crisis concocted by the Game Director will be based on the political simulation in the planning phase. As the planning phase is played through to the conclusion of the third planning period (ninth game year) regardless of whether the crisis occurs at the end of the second or third planning period, a second period crisis requires the players to "turn back the clock." If the Game Director goes back to the second planning period for the crisis, he will provide you with an outbreak scenario based on the political situation in the sixth game year. Similarly, a third period crisis will be introduced by an outbreak scenario tailored to fit the political situation that developed in the third period.

2.7 Information Flow and Required Reports

Figure 2.2 is a diagram showing the flow of information between the two teams and the directing staff at each point of the game. The decisions and reports required of each team are described in greater detail in Section 3 of this manual. The "unclassified" planning data needed to make the decisions are given in Section 4, and the "classified" planning data (weapons system performance and costs, for example) are given in the Team Book which your team will receive at the pre-game briefing.

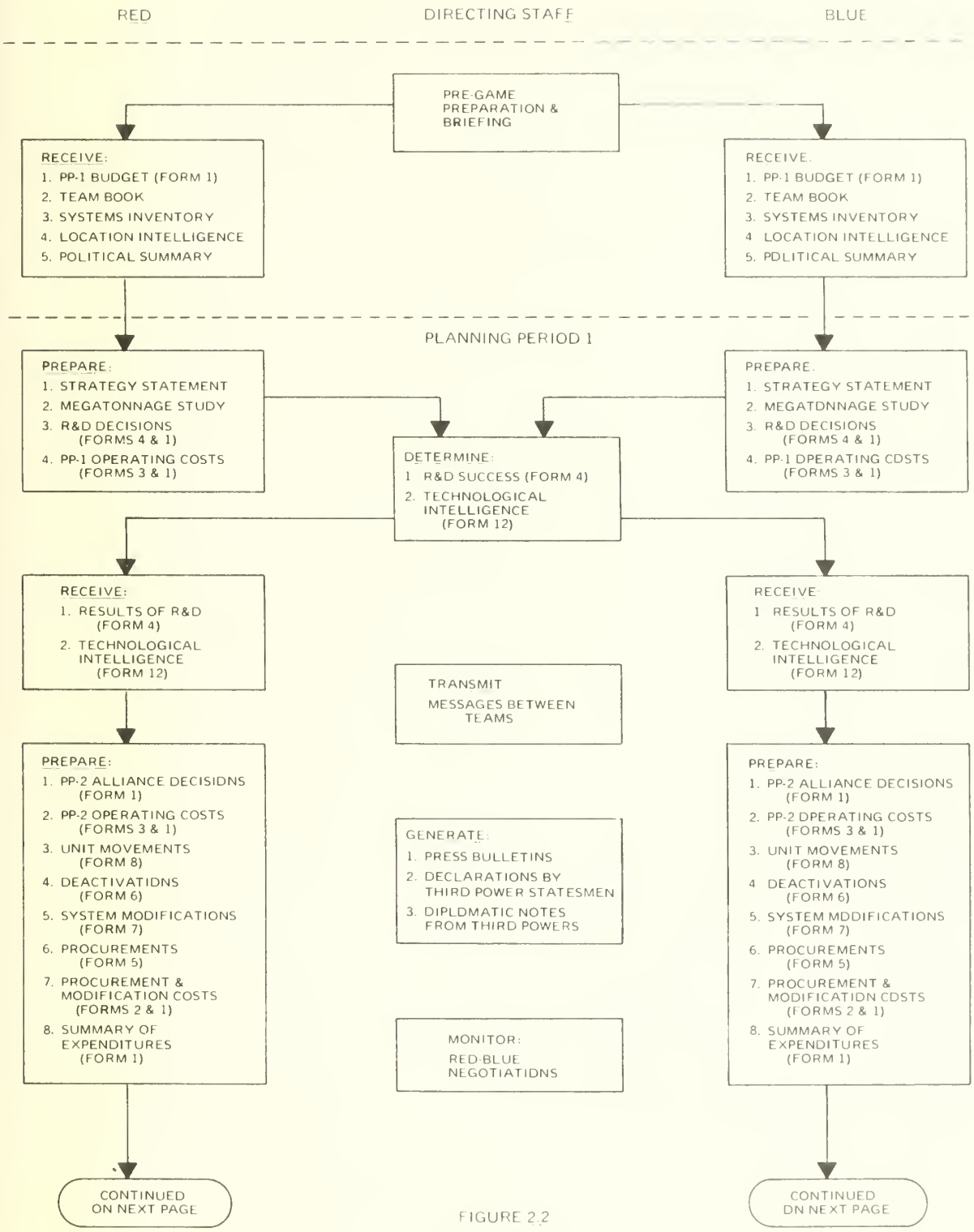

RED
DIRECTING STAFF
BLUE
PRE-GAME PREPARATION & BRIEFING
RECEIVE:
1. PP-1 BUDGET (FORM 1)
2. TEAM BOOK
3. SYSTEMS INVENTORY
4. LOCATION INTELLIGENCE
5. POLITICAL SUMMARY
RECEIVE:
1. PP-1 BUDGET (FORM 1)
2. TEAM BOOK
3. SYSTEMS INVENTORY
4. LOCATION INTELLIGENCE
5. POLITICAL SUMMARY
PLANNING PERIOD 1
PREPARE:
1. STRATEGY STATEMENT
2. MEGATONNAGE STUDY
3. R&D DECISIONS (FORMS 4 & 1)
4. PP-1 OPERATING COSTS (FORMS 3 & 1)
PREPARE:
1. STRATEGY STATEMENT
2. MEGATONNAGE STUDY
3. R&D DECISIONS (FORMS 4 & 1)
4. PP-1 OPERATING COSTS (FORMS 3 & 1)
DETERMINE:
1. R&D SUCCESS (FORM 4)
2. TECHNOLOGICAL INTELLIGENCE (FORM 12)
RECEIVE:
1. RESULTS OF R&D (FORM 4)
2. TECHNOLOGICAL INTELLIGENCE (FORM 12)
RECEIVE:
1. RESULTS OF R&D (FORM 4)
2. TECHNOLOGICAL INTELLIGENCE (FORM 12)
TRANSMIT MESSAGES BETWEEN TEAMS
PREPARE:
1. PP-2 ALLIANCE DECISIONS (FORM 1)
2. PP-2 OPERATING COSTS (FORMS 3 & 1)
3. UNIT MOVEMENTS (FORM 8)
4. DEACTIVATIONS (FORM 6)
5. SYSTEM MODIFICATIONS (FORM 7)
6. PROCUREMENTS (FORM 5)
7. PROCUREMENT & MODIFICATION COSTS (FORMS 2 & 1)
8. SUMMARY OF EXPENDITURES (FORM 1)
GENERATE:
1. PRESS BULLETINS
2. DECLARATIONS BY THIRD POWER STATESMEN
3. DIPLOMATIC NOTES FROM THIRD POWERS
MONITOR:
RED-BLUE NEGOTIATIONS
PREPARE:
1. PP-2 ALLIANCE DECISIONS (FORM 1)
2. PP-2 OPERATING COSTS (FORMS 3 & 1)
3. UNIT MOVEMENTS (FORM 8)
4. DEACTIVATIONS (FORM 6)
5. SYSTEM MODIFICATIONS (FORM 7)
6. PROCUREMENTS (FORM 5)
7. PROCUREMENT & MODIFICATION COSTS (FORMS 2 & 1)
8. SUMMARY OF EXPENDITURES (FORM 1)
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FIGURE 2.2
HALF-SAFE FLOW CHART

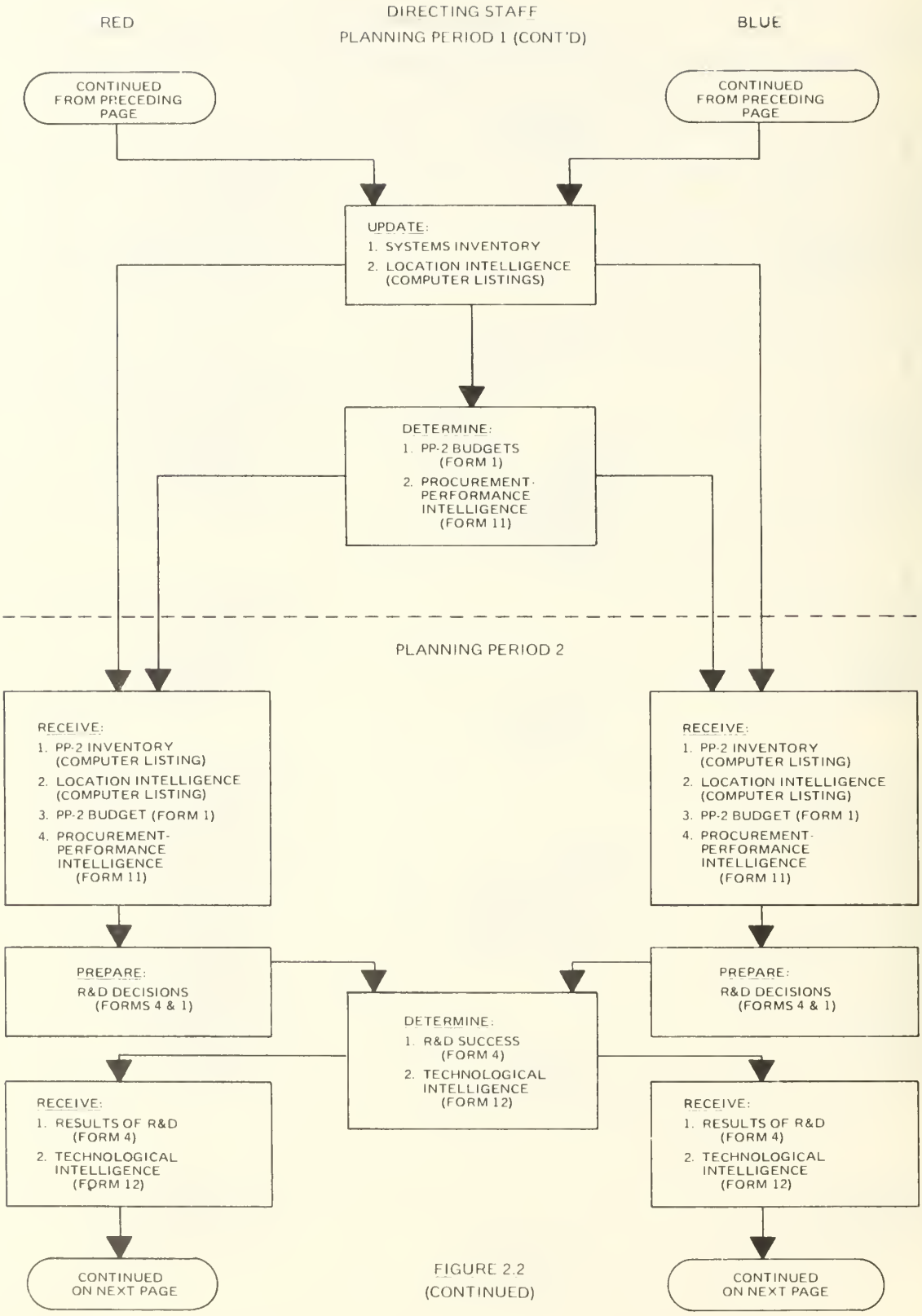

FIGURE 2.2
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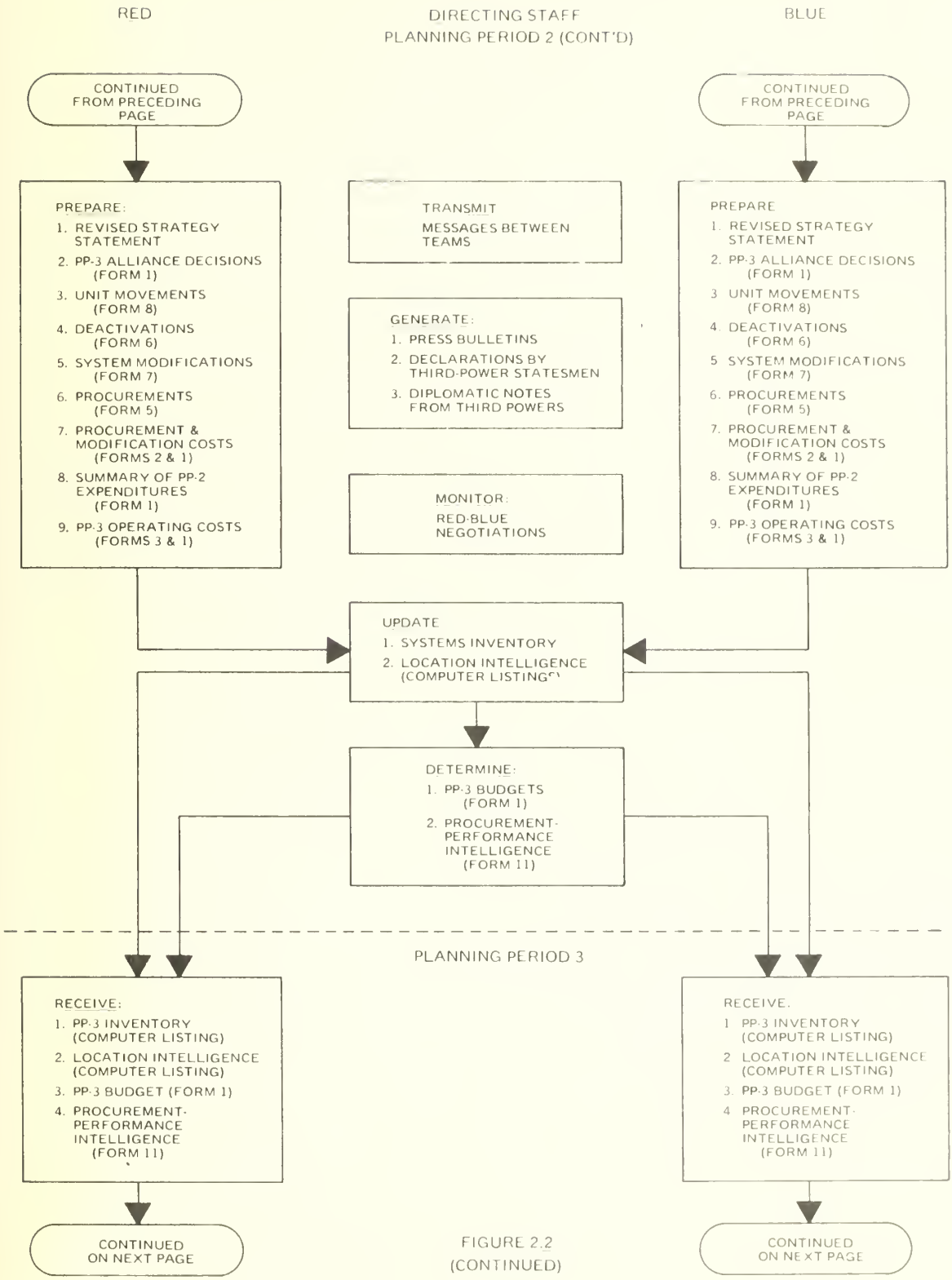
RED
DIRECTING STAFF
PLANNING PERIOD 2 (CONT'D)
BLUE
CONTINUED FROM PRECEDING PAGE
CONTINUED FROM PRECEDING PAGE
PREPARE:
1. REVISED STRATEGY STATEMENT
2. PP-3 ALLIANCE DECISIONS (FORM 1)
3. UNIT MOVEMENTS (FORM 8)
4. DEACTIVATIONS (FORM 6)
5. SYSTEM MODIFICATIONS (FORM 7)
6. PROCUREMENTS (FORM 5)
7. PROCUREMENT & MODIFICATION COSTS (FORMS 2 & 1)
8. SUMMARY OF PP-2 EXPENDITURES (FORM 1)
9. PP-3 OPERATING COSTS (FORMS 3 & 1)
TRANSMIT
MESSAGES BETWEEN TEAMS
GENERATE:
1. PRESS BULLETINS
2. DECLARATIONS BY THIRD-POWER STATESMEN
3. DIPLOMATIC NOTES FROM THIRD POWERS
MONITOR:
RED-BLUE NEGOTIATIONS
PREPARE
1. REVISED STRATEGY STATEMENT
2. PP-3 ALLIANCE DECISIONS (FORM 1)
3 UNIT MOVEMENTS (FORM 8)
4. DEACTIVATIONS (FORM 6)
5 SYSTEM MODIFICATIONS (FORM 7)
6. PROCUREMENTS (FORM 5)
7. PROCUREMENT & MODIFICATION COSTS (FORMS 2 & 1)
8. SUMMARY OF PP-2 EXPENDITURES (FORM 1)
9. PP-3 OPERATING COSTS (FORMS 3 & 1)
UPDATE
1. SYSTEMS INVENTORY
2. LOCATION INTELLIGENCE (COMPUTER LISTING)
DETERMINE:
1. PP-3 BUDGETS (FORM 1)
2. PROCUREMENT-PERFORMANCE INTELLIGENCE (FORM 11)
PLANNING PERIOD 3
RECEIVE:
1. PP-3 INVENTORY (COMPUTER LISTING)
2. LOCATION INTELLIGENCE (COMPUTER LISTING)
3. PP-3 BUDGET (FORM 1)
4. PROCUREMENT-PERFORMANCE INTELLIGENCE (FORM 11)
RECEIVE.
1 PP-3 INVENTORY (COMPUTER LISTING)
2 LOCATION INTELLIGENCE (COMPUTER LISTING)
3. PP-3 BUDGET (FORM 1)
4 PROCUREMENT-PERFORMANCE INTELLIGENCE (FORM 11)
CONTINUED ON NEXT PAGE
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FIGURE 2.2
(CONTINUED)

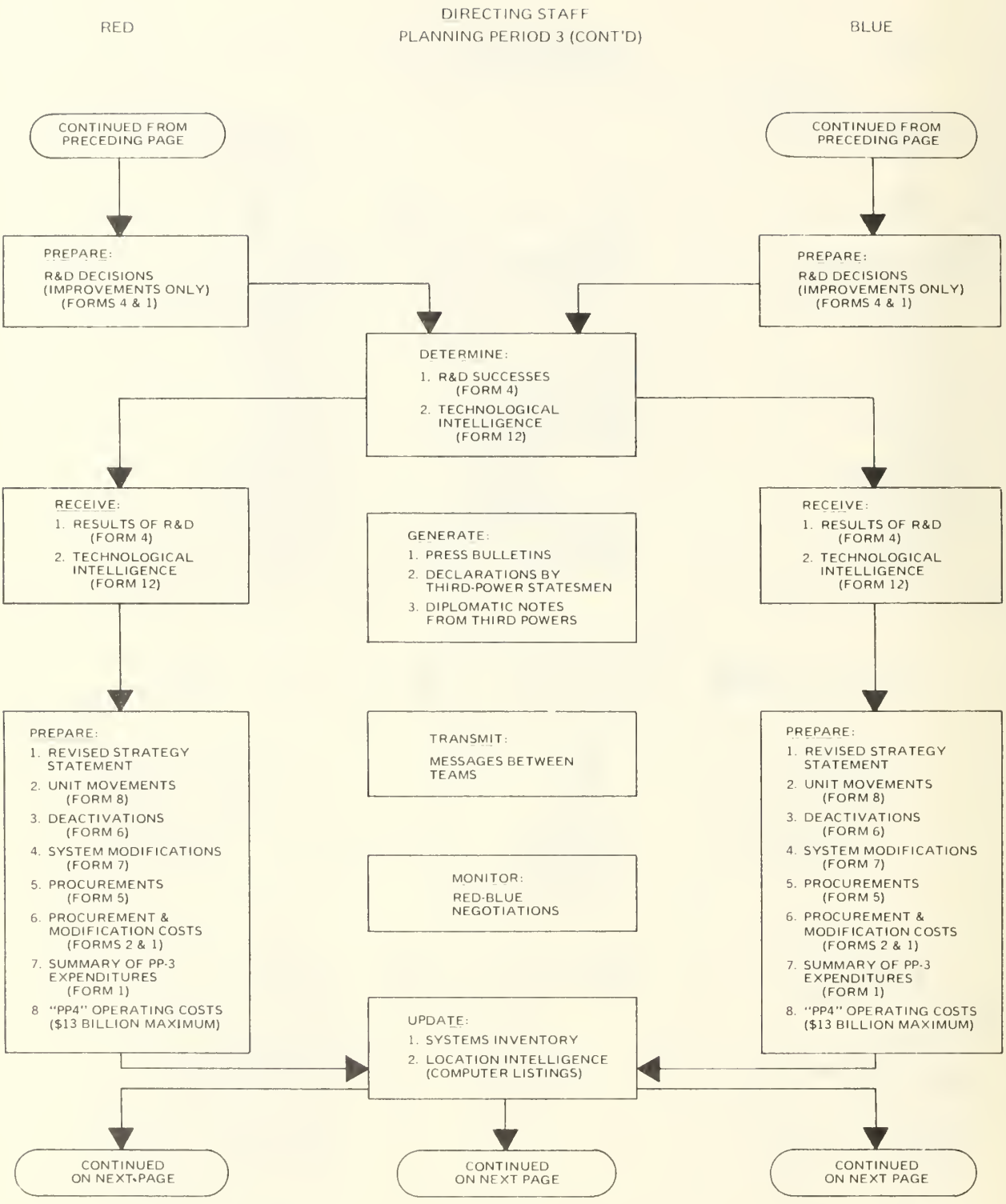
RED
DIRECTING STAFF
PLANNING PERIOD 3 (CONT'D)
BLUE
CONTINUED FROM PRECEDING PAGE
CONTINUED FROM PRECEDING PAGE
PREPARE:
R&D DECISIONS (IMPROVEMENTS ONLY) (FORMS 4 & 1)
PREPARE:
R&D DECISIONS (IMPROVEMENTS ONLY) (FORMS 4 & 1)
DETERMINE:
1. R&D SUCCESSES (FORM 4)
2. TECHNOLOGICAL INTELLIGENCE (FORM 12)
RECEIVE:
1. RESULTS OF R&D (FORM 4)
2. TECHNOLOGICAL INTELLIGENCE (FORM 12)
GENERATE:
1. PRESS BULLETINS
2. DECLARATIONS BY THIRD-POWER STATESMEN
3. DIPLOMATIC NOTES FROM THIRD POWERS
RECEIVE:
1. RESULTS OF R&D (FORM 4)
2. TECHNOLOGICAL INTELLIGENCE (FORM 12)
PREPARE:
1. REVISED STRATEGY STATEMENT
2. UNIT MOVEMENTS (FORM 8)
3. DEACTIVATIONS (FORM 6)
4. SYSTEM MODIFICATIONS (FORM 7)
5. PROCUREMENTS (FORM 5)
6. PROCUREMENT & MODIFICATION COSTS (FORMS 2 & 1)
7. SUMMARY OF PP-3 EXPENDITURES (FORM 1)
8. "PP4" OPERATING COSTS ($13 BILLION MAXIMUM)
TRANSMIT:
MESSAGES BETWEEN TEAMS
MONITOR:
RED-BLUE NEGOTIATIONS
PREPARE:
1. REVISED STRATEGY STATEMENT
2. UNIT MOVEMENTS (FORM 8)
3. DEACTIVATIONS (FORM 6)
4. SYSTEM MODIFICATIONS (FORM 7)
5. PROCUREMENTS (FORM 5)
6. PROCUREMENT & MODIFICATION COSTS (FORMS 2 & 1)
7. SUMMARY OF PP-3 EXPENDITURES (FORM 1)
8. "PP4" OPERATING COSTS ($13 BILLION MAXIMUM)
UPDATE:
1. SYSTEMS INVENTORY
2. LOCATION INTELLIGENCE (COMPUTER LISTINGS)
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FIGURE 2.2
(CONTINUED)

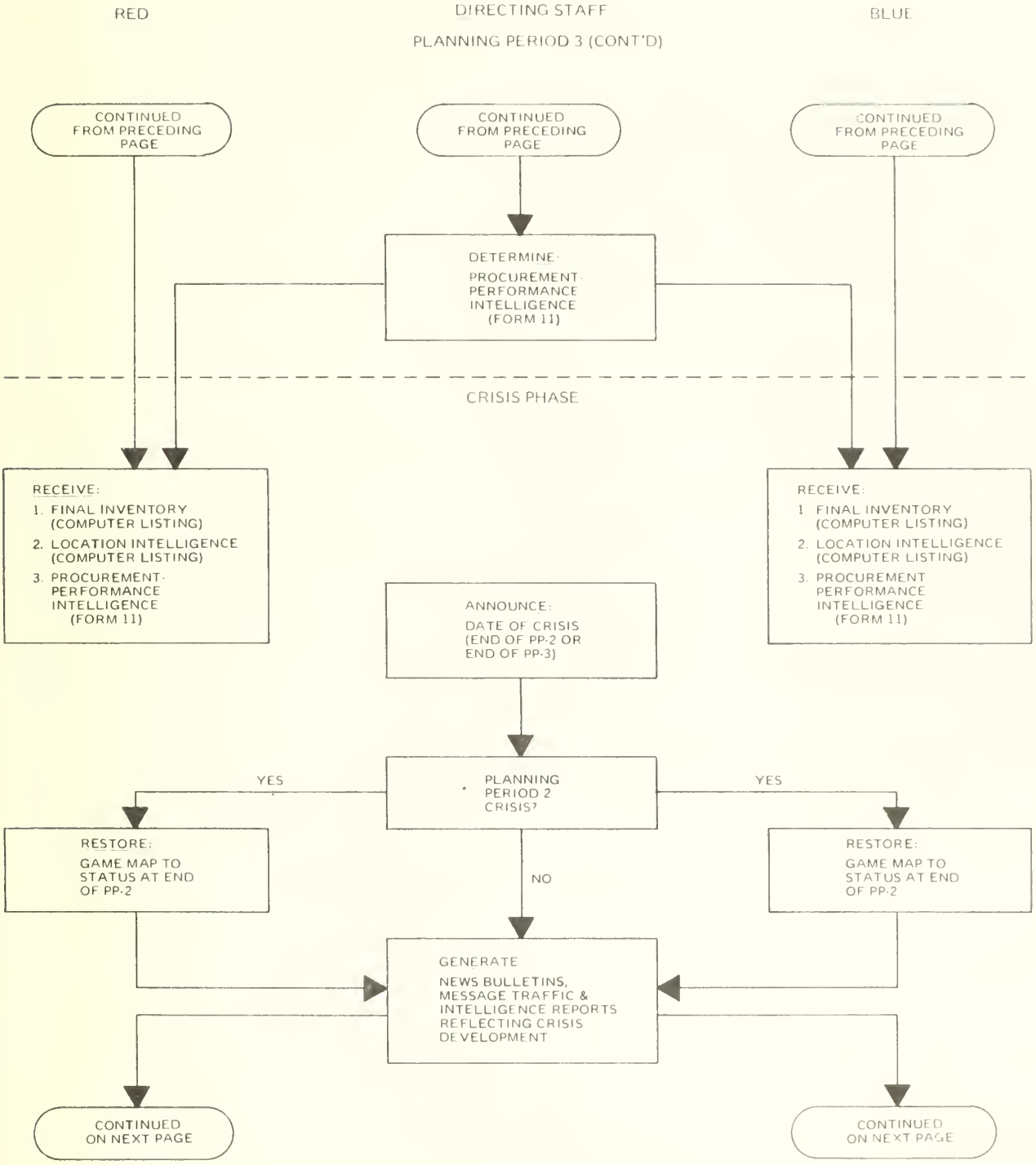

FIGURE 2.2
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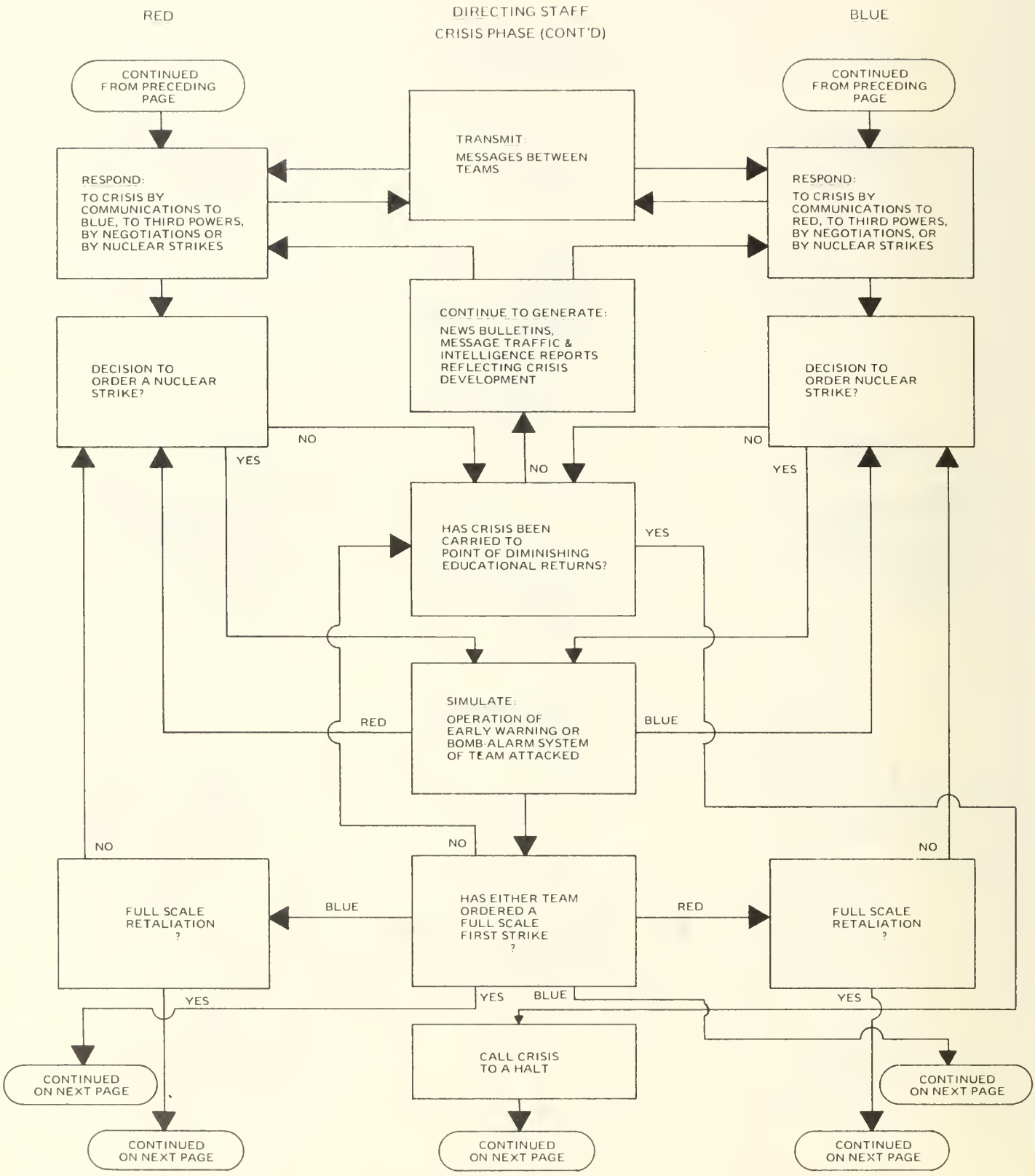

FIGURE 2.2
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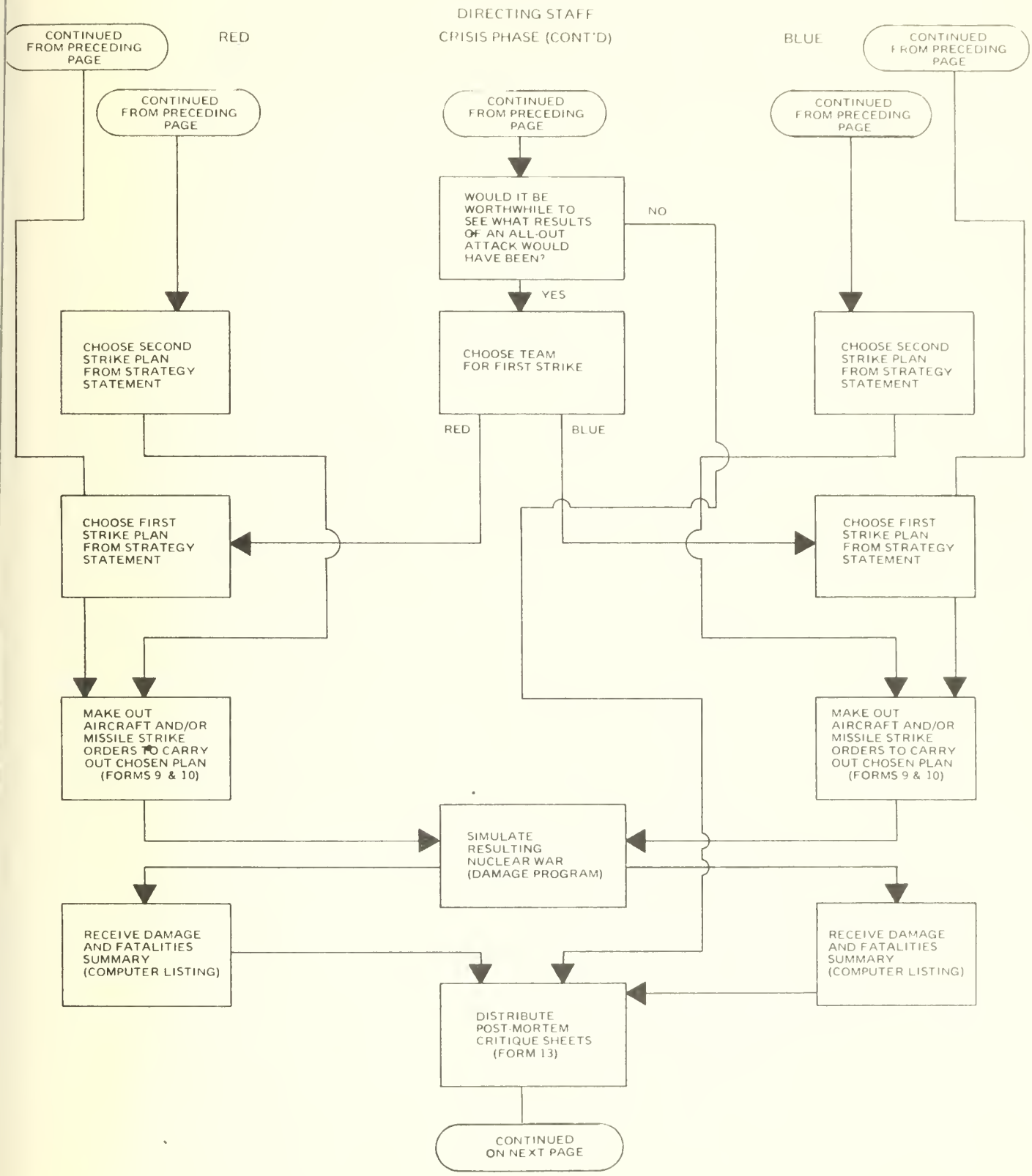
DIRECTING STAFF
CRISIS PHASE (CONT'D)
RED
BLUE
CONTINUED FROM PRECEDING PAGE
CONTINUED FROM PRECEDING PAGE
CONTINUED FROM PRECEDING PAGE
CONTINUED FROM PRECEDING PAGE
CONTINUED FROM PRECEDING PAGE
WOULD IT BE WORTHWHILE TO SEE WHAT RESULTS OF AN ALL-OUT ATTACK WOULD HAVE BEEN?
NO
YES
CHOOSE SECOND STRIKE PLAN FROM STRATEGY STATEMENT
CHOOSE TEAM FOR FIRST STRIKE
CHOOSE SECOND STRIKE PLAN FROM STRATEGY STATEMENT
RED
BLUE
CHOOSE FIRST STRIKE PLAN FROM STRATEGY STATEMENT
CHOOSE FIRST STRIKE PLAN FROM STRATEGY STATEMENT
MAKE OUT AIRCRAFT AND/OR MISSILE STRIKE ORDERS TO CARRY OUT CHOSEN PLAN (FORMS 9 & 10)
MAKE OUT AIRCRAFT AND/OR MISSILE STRIKE ORDERS TO CARRY OUT CHOSEN PLAN (FORMS 9 & 10)
SIMULATE RESULTING NUCLEAR WAR (DAMAGE PROGRAM)
RECEIVE DAMAGE AND FATALITIES SUMMARY (COMPUTER LISTING)
RECEIVE DAMAGE AND FATALITIES SUMMARY (COMPUTER LISTING)
DISTRIBUTE POST-MORTEM CRITIQUE SHEETS (FORM 13)
CONTINUED ON NEXT PAGE

FIGURE 2.2
(CONTINUED)

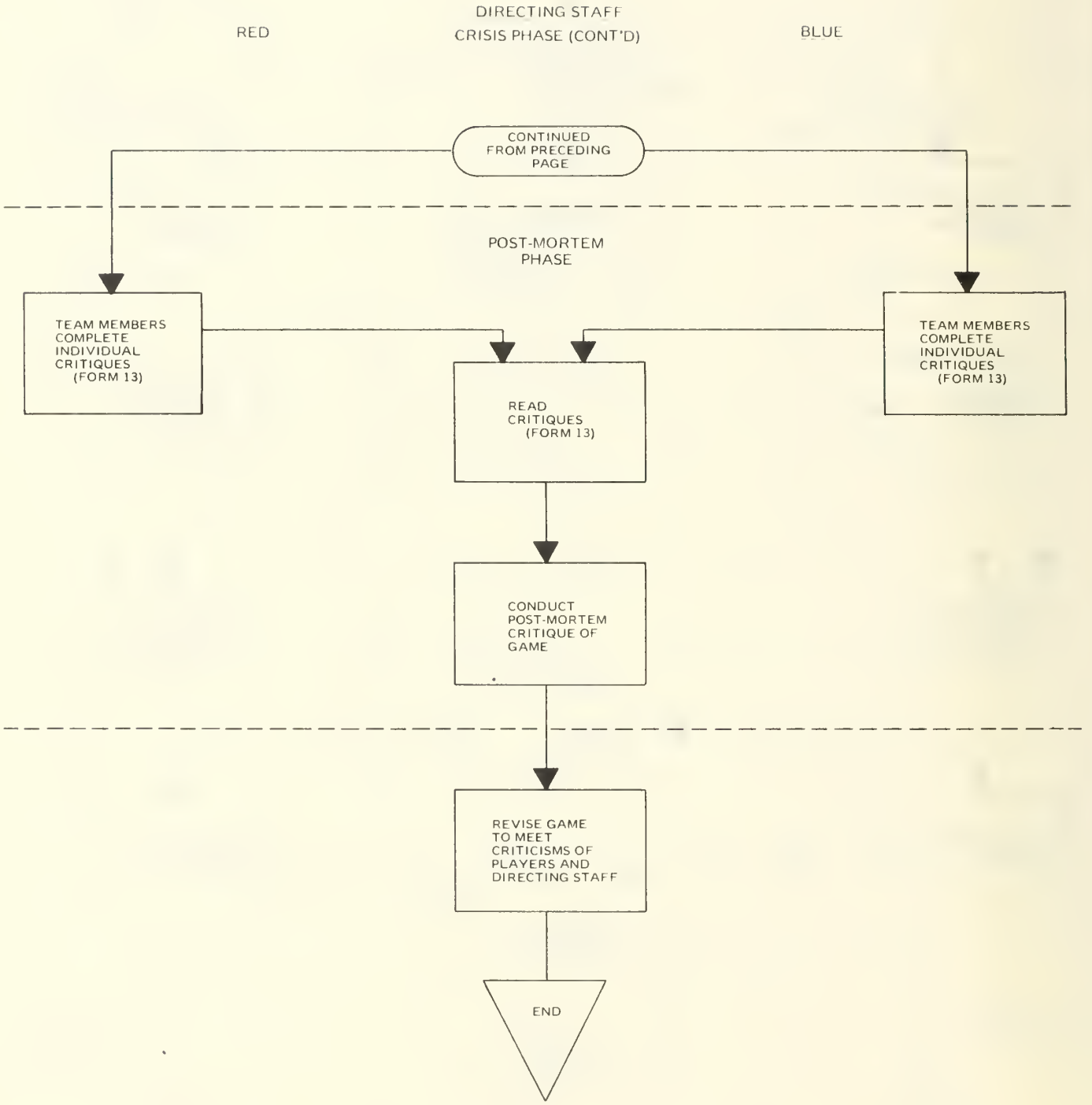
DIRECTING STAFF
RED
CRISIS PHASE (CONT'D)
BLUE
CONTINUED FROM PRECEDING PAGE
POST-MORTEM PHASE
TEAM MEMBERS COMPLETE INDIVIDUAL CRITIQUES (FORM 13)
TEAM MEMBERS COMPLETE INDIVIDUAL CRITIQUES (FORM 13)
READ CRITIQUES (FORM 13)
CONDUCT POST-MORTEM CRITIQUE OF GAME
REVISE GAME TO MEET CRITICISMS OF PLAYERS AND DIRECTING STAFF
END

FIGURE 2.2

3. HOW TO PLAY

3.1 The First Planning Period (Game Years 1 through 3)

Normally you will have more time to complete your work in this planning period than in the two that follow. There are two reasons for this: you will need some extra time to become familiar with the details of the game, and you will be required to produce a megatonnage study that is not required in the last two planning periods.

The megatonnage study is an exercise designed to familiarize each team with the characteristics of its weapons and with the calculations involved in nuclear war planning. The exact details of the study will be announced by the Game Director at the pre-game briefing, but in general the exercise will require you to determine the maximum number of megatons of nuclear weapons your team can expect to detonate in your opponents' territory using the weapons systems you inherit at the beginning of the game. In preparing the study you will need to refer to the weapons system descriptions in the Planning Data section of the Team Book to determine the performance characteristics of your weapons systems. You will also have to refer to the location intelligence report to determine the location and types of anti-aircraft and anti-ballistic missile systems in the inventory of your opponents. Both of these documents will be issued to your team at the pre-game briefing.

The key point to keep in mind when your team prepares the megatonnage study is that not all of your delivery vehicles can be expected to make it to their targets, or even to get off the ground. You will have to make allowance for destruction of your weapons before launch, for aircraft in maintenance and thus unable to fly, for the abort rate of delivery systems due to mechanical and other technical failures, and for the attrition of your attacking forces by your opponents' anti-aircraft and anti-missile defenses.

Another key task that will be required of you during the first planning period is the preparation of your initial strategy statement. The format and required content of the strategy statement will be determined by the Game Director, but you can expect to be required to consult the summary of relations between the two sides in the years before the game begins and the intelligence you will receive on the alliance structure and weapons inventory of your opponent, and building on this information, to predict the strategic contingencies which your team may be required to meet in the nine-year period of the game. For each of these contingencies you will be required to outline what your political and military response will be, and what research and development, alliance, arms control and weapons procurement policies you should undertake to be prepared to prevent or resolve any crises which may grow out of the contingencies you foresee. If your expected response includes the use or the threat of use of your nuclear forces, you will be required to outline what your targetting policy will be, that is, which of your weapons will be directed against the target systems of your opponents.

The directing staff will expect your initial decisions to be guided by your strategy statement, but you are not bound by the statement for the entire game. At the beginning of each planning period you will be given an opportunity to revise the statement to correspond with the changed situation in the game as your team sees it.

At the beginning of the period you will have received your budget for the first three game years. The first decisions you must make regarding allocation of the budget will be in the research and development field. The research and development simulation is described in detail in Section 4.4, below. It should take the directing staff only a few minutes to determine your success or failure in the various research and development projects your team undertakes in the first procurement period. At the same time they will give you your first technological intelligence, a report on the successes achieved by your opponents in their research and development programs.

All of the foregoing should be completed by the halfway point in the planning period. The rest of the period is devoted to final decisions regarding procurement policy, deactivations, movement of mobile units such as bomber and interceptor squadrons and divisions of ballistic missile-firing submarines, modifications to your weapons systems, and alliance policy.

Decisions to ally with other zones are indicated by writing the zone numbers in the appropriate blanks in the Budget Worksheet for the second planning period. Similarly, if you wish to terminate an alliance, all you

need to do is not to record the number of the appropiate zones on the second period Budget Worksheet. You will find the Budget Worksheet (Form 1) in the Budget and Expenditure section of your Team Book. The game rules governing alliances are in Section 4.2 of this manual.

During the first planning period you may deactivate up to one half of the units of any weapons system. (In subsequent periods all units of a weapons system may be deactivated.) Deactivation decisions are recorded on Form 6. The directing staff maintains a supply of these which they will issue as necessary. Similarly, your unit movement decision are recorded on Form 8, modifications on Form 7, and procurement decisions on form 5.

In computer-assisted games all these forms are punch-card transcripts issued by the directing staff. Data on transcripts are later transcribed to cards used as inputs to computer programs which update the weapons system inventories of each team and prepare the location intelligence summaries. In preparing these and other punch-card transcripts you must be exceptionally careful to follow the prescribed formats. The directing staff can often determine from the context of other reports what you meant to do even when you make an error in recording your decisions, but input data for the computer must be perfect. The computer cannot correct your mistakes, and your failure to complete punch-card transcripts correctly and then to proofread them diligently will almost certainly result in spoiled computer runs, delays to the game and the waste of expensive computer time.

Your final task for the first planning period is the completion of your Budget Worksheet. The Game Director uses this sheet (Form 1) to record your budget at the beginning of each planning period. At the end of the period the team uses the sheet to record their expenditures. You will find a Budget Worksheet for each planning period in the Budget and Expenditure section of your Team Book. On it you record your research and development expenditures, procurement costs and operating costs. (The operating costs, incidentally, are those for the forces you had at the beginning of the period. Your decisions to deactivate units or to move them to areas where their operating costs are less are assumed to take effect at the end of the planning period. Any savings in operating costs are enjoyed in the following period.)

Any money left over from your budget at the end of the planning period passes back to the "treasury" of your team and is not available for future use, except that a maximum of one percent of the budget received at the beginning of the planning period can be carried over to planning period two. The "loss" of money to the treasury, however, does not reflect adversely on the team. If you can prepare yourselves to meet the crises you may face later and still afford not to spend ninety-nine percent of your budget, your team deserves praise for efficient use of its resources. The crisis is the test of the wisdom of your frugality.

While you are making the decisions discussed above, and filling out the forms on which your decisions are recorded, you will probably receive

some messages from the other team or some press reports, diplomatic notes from "third powers" or other declarations by statesmen which reflect the development of the political situation. You, of course, are also free to send messages to your opponents or to ask to meet with their delegates to negotiate arms control or other agreements. The Game Director, however, may refuse to transmit notes or to allow such meetings to take place. Normally, his reasons for doing so involve the pressure of time or his perception of developments that cannot be handled within the framework of the game.

To summarize the events of the first planning period, you will receive your Team Book and a computer listing which contains your initial systems inventory and location intelligence on your opponents' initial forces. Your initial budget and your alliances will be indicated on the Budget Worksheet for planning period one in the Budget and Expenditure section of the Team Book. In the first half of the planning period you will prepare:

1. A megatonnage study.
2. An initial Strategy Statement.
3. A report of your first research and development decisions (Form 4 in the Team Book is used to report the decisions, and the R&D expenditures are recorded on Form 1).
4. A report of your operating expenses for the first planning period. (These are the expenses for your inherited forces. They are computed on Form 3 and the total is recorded on Form 1).

The directing staff will determine the results of your R&D programs and give you some intelligence on the R&D of your opponents. At the end

of the planning period you will submit:

1. Your alliance decisions (recorded on Form 1 for the following planning period).

2. Your unit movement decisions (Form 8, carefully prepared and proofread).

3. Your deactivation decisions (Form 6, prepared with equal care).

4. System modification decisions (Form 7, in perfect order).

5. Procurement decisions (Form 5, with all figures checked).

6. Operating costs for the second planning period (recorded on Form 1 for planning period two). These must not exceed 15 billion dollars.

7. Procurement and modification costs (Forms 2 and 1).

8. Your total expenditures for the period, and the amount carried over to the next period (the latter limited to a sum equal to one percent of your budget for the first planning period).

3.2 The Second Planning Period (Game Years 4 through 6)

At the beginning of the second planning period you will receive your budget, and your weapons systems inventory updated to reflect the results of your deactivation, procurement, movement and modification decisions made in the first planning period. You will also receive updated location intelligence. The intelligence will vary in quality depending on the number and location of your espionage teams and the number and performance characteristics of your reconnaissance systems. You will also receive intelligence on your opponents' procurement decisions and on the performance of his weapons systems.

The decisions and reports required in the second planning period are the same as those required in planning period one, except:

1. You do not prepare a megatonnage study.

2. You report only the changes you wish to make to your Strategy Statement.

3. You may deactivate forces without restriction.

3.3 The Third Planning Period (Game Years 7 through 9)

You will receive the same types of information you received in the second planning period, and you will submit the same reports. Your research and development expenditures, however, are restricted to programs for the improvement of existing systems.

3.4 Crisis Phase

The Game Director will announce whether the crisis will occur at the end of the second or the third planning period. He will then begin issuing messages to both teams reflecting the development of the crisis. The passage of time will be indicated by time of transmittal that he will put on all messages (those he issues, and those sent through him from one team to another.) The messages issued by the Game Director will be in the form of press dispatches, intelligence reports, diplomatic cables, messages from other agencies of your team's government, and the texts of radio and television broadcasts.

The teams respond to the crisis by issuing whatever messages to the other team they feel are appropriate. They can also issue press releases, "broadcasts", orders to military forces, messages to allies and other powers, and decisions to put forces on crisis alert. All of these messages

are handed in to the directing staff. The Game Director will take account of them in his message traffic; he will put the time of transmittal on his copy and yours, and he will transmit a copy to your opponents if it is appropriate to do so.

The message traffic in the crisis is usually quite heavy. When the two teams are not completely filling his time with the transmission of messages to their opponents, the Game Director writes and passes on his own messages as fast as he can. Consequently, it is wise to arrange some orderly way of receiving and processing messages within the team, but the details of such arrangements are for the team to decide.

If your team decides to launch a nuclear strike all you need do is inform the Game Director. He will simulate the appropriate command-and-control delays and the operation of the other team's early warning systems. If you are attacked, you will receive word from the Game Director in the form of an early warning or bomb-alarm message. If you decide to respond with a nuclear strike of your own, he will calculate your command-and-control delay and the operation of the other team's early warning network. Both teams will then make out aircraft and missile strike orders (on punch-card transcripts for computer-assisted games) to match the targetting policy for the war plan selected from their Strategy Statement. The directing staff will use the strike orders as input data for a simulated nuclear war. When the teams meet again they will receive reports showing the fatalities and damage to weapons systems that resulted from the nuclear strikes.

If neither team orders a nuclear strike, the Game Director will call a halt to the crisis when he feels it has been adequately resolved. He may then decide to have the teams prepare strike orders for the war they avoided, to see what the results would have been. If he does so, the results will be available for discussion at the next meeting of the game.

3.5 Post-Mortem

The post-mortem meeting usually takes the form of a round-table discussion. In preparation for the meeting the players complete critique forms which are turned in to the directing staff at the end of the post-mortem session. The discussion will be guided by the Game Director and will be tailored to the needs of the group who played the game. The purpose of the session is to highlight the strong and weak points of the game and the performance of the teams in it. Alternative strategies that might have improved the results from each team's point of view are usually discussed, and actions of each team that appear puzzling to their opponents are explained.

The Game Director normally summarizes the conclusions of the group, and the comments made in the meeting and in the critiques are used to revise the game for future use.

4. Planning Data

4.1 Procurement and Operations Cost Differentials.

In the weapons systems descriptions in the Planning Data section of your Team Book procurement and operation costs of systems are stated in terms of cost levels in the team's home territory (ZI costs).

Fixed installations constructed in allied territory (AT) or Arctic (AR) zones have higher procurement costs than the same systems in ZI zones. (Mobile systems such as bombers or submarines are procured at ZI costs regardless of where they are based.)

Operations costs of all systems constructed or based in allied or arctic zones are higher than in the ZI.

The cost ratios involved are given in the following table:

TABLE 4.1.1

PROCUREMENT AND OPERATION COST DIFFERENTIALS			
	ZI	AT [ALLIED TERRITORY]	AR (ARCTIC)
PROCUREMENT	1.0	1.2	3.0
OPERATION	1.0	1.2	1.4

Home territory zones for which Arctic (AR) costs apply are:

Blue: B13.

Red: R8 and R11.

Allied territory zones for which Arctic (AR) costs apply are:

Blue: B17.

Red: None

Allied territory zones for which allied territory (AT) cost apply are:

Blue: B14, B15, B16, B18, B19, B20.

Red: R15, R16, R17, R18.

4.2 Alliances

Your team may "inherit" alliances at the beginning of the game. As the game progresses you may terminate inherited alliances, and you may contract or terminate new ones.

Blue may contract alliances only with zones B17 (Greenland), B18 (Turkey), B19 (Japan), B20 (Western Europe), and B14-B15-B16 (Canada).

Red may contract alliances only with zones R15 (Northeast Europe), R16 (Southeast Europe), and R17-R18 (China).

Note that Canada (zones B14-B15-B16) and China (R17-R18) have been divided into more than one zone due to the size of the countries. Nonetheless, the Blue and Red teams respectively must ally with all zones within Canada or China or ally with none of them.

A team indicates its decision to contract an alliance by writing the appropriate zone number or numbers in the "Allied Budgets" section of its

budget form (Form 1) for the next planning period. Thus, if your team decides to contract an alliance during the first planning period, the appropriate zone number should be entered in the Form 1 for the second planning period. You will find Form 1 in the Budget and Expenditure section of your Team Book.

An alliance permits a team:

(1) To station military forces in the allied territory.

(2) To receive a budgetary supplement from the resources of the ally. (The amount of the supplement is indicated in the Planning Data section of your Team Book).

But alliances also involve potential difficulties:

(1) They introduce a new element to the political environment which may tempt the Game Director to create a more complicated simulation of political developments during the planning and crisis phases.

(2) There is a lag in communications to and from allied territories. (See Planning Data section of your Team Book for details).

(3) Certain programs conducted in a team's home territory may involve unavoidable expenditures in allied territory as well. For example, sheltering your home population requires you to shelter at least some of the population of your allies as well. (The details of such constraints will be found in the Planning Data Section of your Team Book.)

(4) Total expenditures in allied territory must equal at least 110 percent of the budgetary supplement received from the ally concerned.

4.3 Arms Control

Arms control agreements may be negotiated at any time from the start of the game until the final period of play. However, experience in previous games indicates that successful agreements on arms control are usually the result of lengthy negotiations that would have been impossible if the players had not begun them early in the game. Negotiations must take place through written communications and face-to-face meetings between Red and Blue delegates under the supervision of the directing staff.

Arms control agreements may cover the exchange of information between teams and may entail the simulated stationing of inspectors by each team in the territory of the other.

The details of arms control agreements are subject to approval by the Game Director. Information voluntarily transmitted from team to team in accordance with an arms control agreement may be incorrect. (A team may cheat, but it must be prepared for the consequences if the cheating is discovered by the other team.) Information collected by simulated arms control inspectors may also be in error. The probability of inspector error will be determined by the Game Director and will not be communicated to either side. All reports by arms control inspectors will be simulated by the directing staff.

4.4 Research and Development

In the Planning Data section of your Team Book you will find a number of pre-specified research and development projects. These are of two kinds:

projects leading to improvements to existing weapons systems and projects leading to entirely new systems.

At approximately the mid-point of each planning period, the Game Director will require you to submit your Technological Status form (Form 4) to him. You will find this form, one copy of which is used for all three planning periods, in the Budget and Expenditure section of your Team Book. This form is used to indicate which research and development programs you have decided to pursue, and the amount of money you have allocated to each.

Research and development cost are of two kinds; a fixed, "one-shot", development (D) expense which must be paid to get into the program at all, and a research cost (R) which varies with the probability of success you are willing to buy. Both the R and D costs are indicated on the research and development specification forms in your Team Book. The R price stated in them is for a five percent chance of success. This price is multiplied by the number of chances you buy to determine the total amount of your research (R) costs. Thus, if you decide to undertake a research and development project your total expenses for the planning period in which the decisions to do so is made is the amount of the development fund (D) plus the cost of the number of five percent chances of success you decide to buy.

The probability of success for each R&D project is calculated by compounding (not adding) .05, as indicated in the following table:

TABLE 4.4.1

PROBABILITY OF R AND D SUCCESS

NO. OF CHANCES PURCHASED	PROB.	NO. OF CHANCES PURCHASED	PROB.	NO. OF CHANCES PURCHASED	PROB.
1	.05	21	.660	41	.873
2	.097	22	.677	42	.879
3	.143	23	.693	43	.885
4	.186	24	.708	44	.890
5	.226	25	.722	45	.895
6	.265	26	.736	46	.900
7	.302	27	.749	47	.905
8	.337	28	.761	48	.909
9	.370	29	.773	49	.913
10	.405	30	.784	50	.917
11	.431	31	.794	51	.921
12	.460	32	.804	52	.925
13	.487	33	.813	53	.928
14	.512	34	.822	54	.931
15	.538	35	.831	55	.934
16	.560	36	.839		
17	.582	37	.847		
18	.603	38	.854		
19	.623	39	.861		
20	.642	40	.867		

There is space on your Technological Status form (Form 4) for you to indicate the program number (from the R&D specification sheet in your team book), D and R costs, number of R chances bought, total expenditure, and the resulting probability of success for each project. The directing staff will take your form and determine the success of each project undertaken by rolling random number dice or by otherwise generating a random 3-digit number. If the number is less than or equal to the probability of success you have purchased, the directing staff will mark your technological status form to

indicate that you have succeeded in the project.

If you do not succeed in the planning period in which a research and development project is first undertaken, the same chance of success will be reapplied in each succeeding period without additional expense. However, if you want to improve your chances of success in later periods, you may purchase additional R chances and the new, higher probability of success will be used by the directing staff when they determine which projects succeed.

Success in a research and development project for an improvement to an existing weapons system enables you to apply the improvement to all units of the system during the planning period in which success is achieved and without further expense.

Success in an R&D project for a new system makes that system available for purchase in the next planning period at the purchase price indicated on the R&D specifications sheet. That price normally consists of a base figure in millions of dollars plus a random number of millions of dollars (r) generated by the planning staff after R&D success has been achieved.

Your team may propose novel R&D projects to the Game Director at any time. These are submitted for his approval on R&D specification forms (Form 14 for a project leading to a new system, and Form 15 for an improvement to an existing system). These forms are identical to the ones used to describe prespecified R&D projects in your Team Book. Your team must be prepared to justify all performance and cost figures in your proposal, and

the Game Director has the right to accept these figures, revise them, or to deny permission for you to undertake the project. He may also demand time to consult technical experts to verify your cost and performance data before ruling on your project. As a result, it is wise to prepare novel R&D proposals for his consideration as early as possible in each planning period.

4.5 Intelligence

4.5.1 Performance Intelligence.

The performance characteristics of your opponents' novel weapons systems are described in general (and sometimes slightly erroneous) form by the Game Director. For this purpose he uses the lower half of the Procurement/Performance Intelligence form (Form 11) in the Intelligence section of your Team Book. Performance intelligence is reported at the end of each planning period.

4.5.2 Procurement Intelligence.

Procurement intelligence is also recorded by the Game Director on the Procurement/Performance Intelligence form (Form 11) in the Intelligence section of your Team Book. He will report on your opponents' procurement expenditures at the end of each planning period. The figures you receive are rounded and there is some chance that a particular item of expenditure will be skipped in the report. The degree of rounding (to the nearest ten million, fifty million, etc.) is not announced, nor is the probability of an expenditure not being reported. The maximum probability of missing an expenditure, however, is fifty percent, and the probability drops as the amount of the expenditure increases. The degree of rounding and the

probability of not having an expenditure reported may be different for each team.

4.5.3 Technological Intelligence

Intelligence on your opponents' research and development successes is reported at the end of each planning period on the Technological Intelligence form (Form 12) found in the Intelligence section of your Team Book. The probability of discovery of an R&D success varies with the number of espionage units your team deploys in your opponents' territory, as indicated in Table 4.5.3.1, below. (However, a team may specify a deliberate leak of intelligence on an R&D success, in which case the opponent is sure to have it reported on his Technological Intelligence form.)

TABLE 4.5.3.1

TECHNOLOGICAL INTELLIGENCE

INTELLIGENCE REGARDING ENEMY SUCCESS IN RESEARCH AND DEVELOPMENT IS BASED UPON THE TABLE BELOW. NOTICE THAT PROBABILITIES DIFFER FOR PRESPECIFIED AND NOVEL SYSTEMS.

		PRESPECIFIED	NOVEL
		.500	.300
ESPIONAGE UNITS IN OPPONENT'S TERRITORY	1	.550	.350
	2	.597	.397
	3	.643	.443
	4	.686	.486
	5	.726	.526
	6	.765	.565
	7	.802	.602
	8	.837	.637
	9	.870	.670
	10	.905	.705
	11	.931	.731
	12	.960	.760
	13	.987	.787
	14	.993	.812
	15	1.000	.838
	16		.860
	17		.882
	18		.903
	19		.923
	20		.942
	21		.960

4.5.4 Location Intelligence

Location intelligence on your opponents' current forces and their deployment will be reported to you at the beginning of the game and at the end of each planning period. In computer-assisted games this information is in the form of a computer listing whose format will vary depending on the nature of the computer facilities available to the directing staff and the characteristics of the programs they use to produce the information. Your Game Director will brief you on the format in which the information will appear, or he will transmit that information to you in a supplement to this manual.

In Half-SAFE the location of fixed installations is reported with two degrees of precision. Installations are reported as exactly (E) or approximately (A) located within a zone. If an installation is exactly located it can be targeted for a nuclear strike. If it is approximately located it is assumed to be located with an accuracy of six nautical miles, and several nuclear weapons may have to be targeted against it to achieve an acceptable probability of destruction even though the target is relatively "soft". (See Section 4.12).

If a target is exactly located you will also be told whether it is soft (i.e., that it will be destroyed by overpressures of 7 pounds per square inch or less). But note that in Half-SAFE targets range from hardnesses of 2 to 1000 psi, and that you will not be told exactly how hard your opponents' installations are. However, in some cases you may derive some evidence of hardness from your technological intelligence on your opponents' weapons

systems.

If the installations of a given system are protected by anti-aircraft point defenses, and one or more of the installations is exactly located, the probability that the type and number of defending systems will be correctly reported is .90. For the probability of location of point defenses protecting urban areas, see Table 4.5.4.2.

The probability of locating a counter-intelligence team is determined by compounding .50 for each espionage team present in the zone in which the counter-intelligence team is deployed.

TABLE 4.5.4.1

PROBABILITY OF LOCATION (1)

TARGET TYPE	NUMBER OF S_POINTS PRODUCED BY ESPIONAGE IN ZONE											
	0.5	1	1.5	2	2.5	3.0	3.5	4	5	6	7	≥8
BLAST AND FALLOUT SHELTER UNITS	.75A	.99A	.99A	.99A	.99A	.99A	.99A	.99A	.99A	.99A	.99A	.99A
ROAD_MOBILE BALLISTIC MISSILES	0	.06A	.12A	.18A	.24A	.30A	.34A	.37A	.40A	.43A	.47A	.50A
SUBMERSABLE BARGE LAUNCHED BALLISTIC MISSILES	0	.19A	.18A	.27A	.36A	.41A	.45A	.50A	.56A	.62A	.68A	.75A
COMMAND AND CONTROL CENTERS	.12E .25A	.25E .50A	.35E .60A	.44E .75A	.51E .80A	.58E .86A	.62E .88A	.68E .91A	.76E .96A	.82E .97A	.87E .99A	.90E .99A

NOTE: SUFFIXES TO PROBABILITIES:

A APPROXIMATELY LOCATED
E EXACTLY LOCATED

TABLE 4.5.4.2.

PROBABILITIES OF LOCATION (II)

TARGET TYPE	NUMBER OF S+R POINTS PRODUCED BY INTELLIGENCE IN ZONE											
	.5	1	1.5	2	2.5	3	3.5	4	5	6	7	≥ 8
POINT DEFENSES OF URBAN AREAS, ZONAL ANTI-AIRCRAFT AND ANTI-BALLISTIC MISSILE DEFENSES	.25E .50A	.50E .71A	.67E .85A	.75E .90A	.81E .93A	.87E .96A	.90E .96A	.94E .99A	.97E .99A	.98E .99A	.99E	.99E
TRAIN-LAUNCHED BALLISTIC MISSILES	.07A	.20A	.30A	.41A	.47A	.53A	.60A	.64A	.68A	.72A	.76A	.80A
SURFACE-BARGE LAUNCHED BALLISTIC MISSILES	0	.11A	.22A	.33A	.38A	.43A	.48A	.52A	.56A	.60A	.64A	.67A
AIRFIELDS AND SUBMARINE BASES	.75E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E

NOTE : SUFFIXES TO PROBABILITIES :
A APPROXIMATELY LOCATED
E EXACTLY LOCATED

TABLE 4.5.4.3.

PROBABILITY OF LOCATION OF HARD-LAUNCHERS & FIXED BALLISTIC MISSILES

NUMBER OF R-POINTS PRODUCED	NUMBER OF S_ POINTS PRODUCED BY ESPIONAGE IN ZONE												
	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
0	0	.02E .15A	.05E .38A	.08E .60A	.10E .67A	.13E .73A	.18E .80A	.23E .87A	.30E .93A	.40E .99A	.48E .99A	59E .99A	68E .99A
1	.27E	.30E .43A	.46E .73A	.53E .80A	.60E .87A	.67E .93A	.73E .99A	.77E .99A	.80E .99A	.84E .99A	.87E .99A	.90E .99A	.93E .99A
2	.46E	.53E .80A	.60E .87A	.67E .93A	.73E .99A	.77E .99A	.80E .99A	.84E .99A	.87E .99A	.90E .99A	.93E .99A	.96E .99A	.99E
3	.60E	.63E .73A	.73E .95A	.77E .99A	.80E .99A	.84E .99A	.87E .99A	.90E .99A	.93E .99A	.96E 99A	.99E	.99E	.99E
4	.67E	.73E .80A	.77E .99A	.80E .99A	.84E .99A	.87E .99A	.90E .99A	.93E .99A	.96E .99A	.99E	.99E	.99E	.99E
5	.73E	.77E .99A	.80E .99A	.84E .99A	.87E .99A	.90E .99A	.99E .99A	.96E .99A	.99E	.99E	.99E	.99E	.99E
6	.80E	.84E .99A	.87E .99A	.90E .99A	.93E .99A	.96E .99A	.99E	.99E	.99E	.99E	.99E	.99E	.99E
7	.87E	.90E .90A	.93E .99A	.96E .99A	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E
≥ 8	.93E	.96E .99A	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E	.99E

NOTE : SUFFIXES TO PROBABILITIES
A APPROXIMATELY LOCATED
E EXACTLY LOCATED

4.6 Counter-Intelligence

Counter-intelligence systems are of two kinds: those that warn you of the presence of the intelligence systems of your opponents, and those that frustrate the operation of his intelligence systems.

The performance characteristics of the counter-intelligence systems available to your team are given in the weapons system descriptions in the Planning Data section of your Team Book, but an additional word of explanation is appropriate here. Please note that systems that warn of the presence of espionage teams do not automatically hamper the effectiveness of the teams they discover. It is up to your team to decide what action is to be taken when an opposing espionage team is detected. You can "arrest" the team and announce to your opponents that you have done so; you can quietly destroy the team (in which case the first indication to your opponents that you have done so will come when they receive their next location intelligence listing and find neither the intelligence they expect nor the espionage team); or you can decide to do nothing and keep the team "under observation". Be sure to tell the Game Director what you want to do about the espionage teams you discover. He will take care of the rest.

4.7 Weapons System Procurement, Use and Hardening Constraints

1. All offensive and defensive installations of the same system number must be of uniform hardness throughout the territory of the team and its allies.

2. All fixed installations of the same system number must be defended by an equal number of point defenses. The point defenses must be of the

same system number.

3. Installations can be raised in hardness only once and by only one level, that is, from soft (2, 4 or 7 psi.) to 100 psi, from 100 to 300 psi., or from 300 to 1000 psi. Hardening a unit of any system costs 120 percent of the difference in procurement cost of a unit at the original hardness and a unit at the improved hardness. Hardening costs are reported on Form 2 using the following cost accounting numbers in place of system numbers: soft to 100 psi., 8143; 100 to 300 psi., 8144; and 300 to 1000 psi., 8145.

4. All aircraft of the same system number and alert status must be provided with identical loads.

5. R&D for <u>further improved</u> performance (including further improved CEP) may not be purchased until R&D success on <u>improved</u> performance has been achieved.

6. ICBM's and IRBM's of the same system number must be equipped with identical numbers and types of decoys, penetration aids and MIRV's.

4.8 Ballistic Missile Trajectory Time and Target Coverage.

4.8.1 Intermediate-Range Ballistic Missiles (IRBM's).

Trajectory Time: 15 minutes.

TABLE 4.8.1.1.

TARGET COVERAGE BY IRBM'S		
IRBM'S CAN ONLY BE FIRED BETWEEN THE FOLLOWING ZONES		
BLUE ZONES		RED ZONES
B 13	AND	R 11
B 20	AND	R1, R2, R3, R6, R15, R16
B 18	AND	R1 THROUGH R7, R9, R15, R16
B19	AND	R14, R17

4.8.2 Submarine-Launched Ballistic Missiles.

Trajectory time: 15 minutes.

TABLE 4.8.2.1.

TARGET COVERAGE BY SUBMARINE-LAUNCHED BALLISTIC MISSILES (ASSUMING 2500 NAUTICAL MILE RANGE)		
OCEAN	RED ZONES WITHIN RANGE OF BLUE MISSILES	BLUE ZONES WITHIN RANGE OF RED MISSILES
ATLANTIC	R1 THROUGH R9, R15, R16	B1 THROUGH B12, B14 THROUGH B18, B20
PACIFIC	R11 THROUGH R14, R17, R18	B1 THROUGH B17, B19
ARCTIC	R1 THROUGH R16	B1, B2, B4, B6, B7, B9, THROUGH B18, B20
MEDITERRANEAN	R1 THROUGH R10, R15, R16	B18, B20
INDIAN	R2 THROUGH R7, R9, R10, R12, R17, R18	NONE
GULF OF MEXICO	NONE	B1 THROUGH B12, B14 THROUGH B16

4.8.3 Intercontinental Ballistic Missiles (ICBM's) on Direct Trajectories

Trajectory time: 30 minutes on intercontinental trajectories, 15 minutes on intermediate range trajectories (see Table 4.8.1.1, above).

Intercontinental Ballistic Missiles can be fired directly between any pair of Red and Blue zones except between Blue zones B3, B5 or B8 and Red zone R18.

4.8.4 Intercontinental Ballistic Missiles (ICBM's) on Trans-Antarctic Trajectories

Trajectory time: 60 minutes.

Any ICBM which has a maximum yield of 4 megatons or more can be fired between any Red and Blue zones on a trans-Antarctic trajectory. However, when this trajectory is used the missile's accuracy-yield level (AYL) is increased by 9.

4.9 Aircraft Range and Air Distances

The range of an aircraft varies with its system number, mission profile and whether or not it is air-refuelled. Range data for each aircraft type will be found in the Weapon System Descriptions in the Planning Data section of your Team Book.

Tables 4.9.1, 4.9.2, 4.9.3 and 4.9.4 are used to determine the air distance from an aircraft's launch base to its targets and then to the nearest friendly territory for recovery. Three steps are necessary to determine the total distance the aircraft will fly on its mission. The distance from the launch base to the zone in which the aircraft first enters hostile territory (the penetration zone) is found by consulting Table 4.9.1 for Blue or Table 4.9.3 for Red. If all the aircraft's targets

are in the penetration zone, the total mission distance is found by adding the launch-penetration distance to the minimum recovery distance given at the bottom of Table 4.9.2 for Blue or 4.9.4 for Red. If the aircraft must fly through several hostile zones, the total mission distance is found by adding the launch-penetration distance to the distance flown from one hostile zone to another and then adding the minimum recovery distance. The inter-zonal distances and the minimum recovery distances are found in Table 4.9.2 for Blue and 4.9.4 for Red.

TABLE 4.9.1

BLUE AIR DISTANCE CHART I: Distances Between Launch Zones and Penetration Zones (Nautical Mi X 100)

Blue Launch Zones:		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
	R1	39	37	44	40	45	41	42	47	44	46	44		35	40	37	33	21	14	40	12
Penetration	R7																	43	6		20
Zones	R8	39	37	44	40	44	40	42	47	41	46	41	46	31	37	35	33	19	18	36	18
Within	R11	40	39	40	39	41	35	38	44	33	37	31	36	19	28	32	36	21	35	25	31
4000 nm	R14											43	45	30	41					9	
Of Launch	R15	37	35	42	39	43	41	44		43		45		38	42	38	32	23	12		6
Zone	R16	41	39	43	43		46									43	35	30	12		7
	R17													40					43	8	
	R18													47					44	15	

TABLE 4.9.2

BLUE AIR DISTANCE CHART II

Distances Between Adjacent Red Zones and Minimum Recovery Distance to Friendly Territory

(Nautical Miles X 100)

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18
R1		3						6							7			
R2	3		3	5	4	4									5			
R3	3	3			3													
R4	3	5			3			4	5									
R5	4	4	3	3					9	11								
R6	4						4								7	6		
R7	4									12						9		
R8				4					5		18							
R9				5	9			5		8	20	4					21	17
R10					11		12		8			11						
R11								18	20			11	21					
R12									4	11	11		7				16	17
R13												7		14			11	
R14													14				17	
R15						7	6									6		
R16							9								6			
R17																		12
R18																		
Minimum Recovery Range To Friendly Territory	6	7	9	10	10	7	6	10	15	16	15	21	18	8	7	7	8	15

TABLE 4.9.3

RED AIR DISTANCE CHART I: Distances Between Launch Zones and Penetration Zones (Nautical Mi X 100)																			
Red Launch Zones:		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18
	B1	41	42	44	45	46	45		43							38	40		
	B2	39	40	42	43	44	43		41							36	38		
	B3	45	46													42	44		
Penetration	B11											35			40				
Zones	B12											44			43				
Within	B13	35	37	36	35	38	40	42	31	36	42	23	35	31	26	33	41	36	42
4700 nm	B14	40	43	42	42	44	46		37	43		30	44	41	36	42	45	46	46
Of Launch	B15	37	40	40	39	42	42	46	35	41		31	43	43	41	38	41		
Zone	B16	33	35	36	37	38	38	41	33	40		36	45			32	35		
	B17	20	23	24	24	25	28	30	19	26	35	21	29	30	34	23	26	29	36
	B18	14	11	12	13	10	7	6	20	15	10	30	21	28	42	12	10	37	8
	B19	39	40	37	36	38	41	39	36	33	29	25	24	15	8	45	47	8	12
	B20	12	11	14	16	15	13	17	18	21	23	34	29	35	46	6	7		

TABLE 4.9.4

RED AIR DISTANCE CHART II

Distances Between Adjacent Blue Zones and Minimum Recovery Distance to Friendly Territory (Including and Excluding Cuba)

(Nautical Miles X 100)

		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
																					B20
																				B19	
																			B18		18
																		B17			19
																	B16	14			32
																B15	12	15			
															B14	11		19			
														B13	11					33	
													B12								
												B11	6		4						
											B10	9	7								
										B9	6	5			6						
									B8		5										
								B7	5	6	5										
							B6	3		4						5					
						B5		6	5												
					B4	5	6	5								5	7				
				B3	6	3															
			B2	7	5											4					
		B1	5																		
Minimum Recovery Range to Friendly Territory	Excl Cuba	37	35	41	36	39	31	34	37	28	34	25	29	11	23	27	32	19	6	8	6
	Incl Cuba	11	13	6	12	7	18	13	19	19	17	24	22	11	23	21	17	19	6	8	6

4.10 Outbreak Timing Factors

1. Attacker: The team which first launches a nuclear strike.

2. Defender: The team which is the victim of the strike launched by the attacker.

3. Zero-Hour: The time at which the first nuclear attack of the game is ordered.

4. H-Hour: The time at which the first attacking missile or aircraft is launched. If the attacking team does not specify a later time, H-Hour is twelve minutes after Zero-Hour, plus or minus the time adjustment indicated in Table 4.10.1.

TABLE 4.10.1

NORMAL COMMAND AND CONTROL DELAY							
EQUALS 12 MINUTES (6 IF TENSION ALERT IS DECLARED) PLUS OR MINUS 0 TO 9 MINUTES, RANDOMIZED AS FOLLOWS:							
Random Number Generated By Directing Staff	01 OR 02	03 THRU 12	13 THRU 32	33 THRU 57	58 THRU 82	83 THRU 97	98 THRU 00
INCREASE OR REDUCTION OF DECISION TIME	-5	-4	-3	0	+3	+6	+9

5. Attack Detection Time: The time between H-Hour and the defender's detection of the attacker's missiles or aircraft. Each team is assumed to have a BMEWS system (which is not shown in the team's systems inventory). Attack detection time depends upon the vehicle used for the attack and the presence or absence of Ballistic Missile Early Warning Satellites and Anti-Submarine Warfare Systems in the defender's systems inventory. For details see Tables 4.10.2 and 4.10.3.

TABLE 4.10.2

MISSILE DETECTION TIME IN MINUTES AFTER LAUNCH						
PHENOMENON TO BE DETECTED		DETECTION SYSTEMS: BMEWS ONLY	BMEWS PLUS: 1 BMEW SATL SYS	BMEWS PLUS: ≥2 BMEW SATL SYS	ASW SYSTEMS IN OCEAN OF LAUNCH: 1	ASW SYSTEMS IN OCEAN OF LAUNCH: ≥2
ICBM'S (DIRECT TRAJECTORY)	<15	15	15	15	–	–
	≥15	12	9	6	–	–
ANTARCTIC TRAJECTORY ICBM'S	≤15	NO WARNING	15	12	–	–
	≥15	NO WARNING	9	6	–	–
IRBM'S		9	9	6	–	–
AIR-LAUNCHED BALLISTIC MISSILES		NO WARNING	9	6	–	–
SUB-LAUNCHED BALLISTIC MISSILES		NO WARNING	9	6	6	3

TABLE 4.10.3

BOMBER DETECTION TIME IN MINUTES AFTER LAUNCH								
RANDOM NUMBER GENERATED BY DIRECTING STAFF	1 THRU 4	5 THRU 9	10 THRU 14	15 THRU 20	21 THRU 28	29 THRU 36	37 THRU 70	71 THRU 00
BOMBERS DETECTED AT LAUNCH PLUS:	15	30	45	60	75	90	105	120

6. X-Hour: The time at which the first of the defender's missiles or aircraft is launched. If the defender orders a nuclear strike upon detection of the attacker's missiles or aircraft, X-Hour occurs twelve minutes after attack detection, plus or minus the time adjustment shown in Table 4.10.1. If the defender has suffered the destruction of part of his command and control system before he decides to launch a nuclear strike, X-Hour is further delayed by the amount of time shown in Section 4.11, Table 4.11.2.1.

7. Aircraft Launch Rate: The rate at which bombers and tankers are launched on their missions. Ordinarily, the attacker's first four ground alert aircraft at each base will launch at H-Hour, and four additional ground-alert aircraft will be launched at each succeeding minute. After all ground-alert aircraft have been launched, non-alert aircraft will take off at the rate of one every ten minutes until the base is destroyed or the supply of aircraft not in maintenance has been exhausted. If the defender orders a nuclear strike at detection of the attacker's forces, the defender's first ground-alert aircraft will launch at X-Hour plus three minutes. The defender's aircraft then continue to launch at the same rate as the attacker's.

8. Premeditated Attack: A nuclear attack that is neither a last-minute preemptive strike nor a response to the detection of an attack by the opposing team. Preventive wars and preemptive attacks launched more than two hours before the other team is expected to order a nuclear strike are in this category. In premeditated attacks (which must be authorized by the Game Director) the attacking team may launch all or part of its ground-alert aircraft up to two hours before the launch of its first missiles, and launch time of missiles may be distributed over a one hour period.

9. Coordinated Strike: A nuclear strike in which weapons carriers are launched at something other than the maximum launch rate. This is normally done to achieve simultaneous detection of the attackers by the opposing team or to saturate defenses.

10. Nuclear Explosion Detection Time: Each team is assumed to be equipped with a bomb-alarm system in its own and allied territory and to monitor nuclear explosions in the territory of its opponents and the opponents' allies. The bomb alarm and monitoring systems are not shown

in the team's system inventory. Ballistic missile early-warning satellites also have a nuclear-detonation detection capability, as do anti-submarine warfare systems for nuclear explosions that occur in the oceans in which such systems are deployed. The time which elapses between a nuclear explosion and the report of its occurance varies with location of the explosion and the team's deployment of BMEW satellite and ASW systems, as indicated in Table 4.10.4.

TABLE 4.10.4.

NUCLEAR EXPLOSION DETECTION TIME IN MINUTES AFTER DETONATION						
		NUMBER OF BMEW SATELLITE SYSTEMS			NUMBER OF ASW SYSTEMS IN OCEAN OF DETONATION	
		0	1	≥ 2	1	> 2
LOCATION OF EXPLOSION	OWN TERRITORY	1	1	1	—	—
	ALLIED TERRITORY	4	4	4	—	—
	TERRITORY OF OPPONENT OR HIS ALLIES	8	8	6	—	—
	ELSEWHERE ON LAND	30	9	6	—	—
	AT SEA	60	9	6	6	3

11. Missile Launch Times: In a coordinated strike missiles are launched at the time selected by the launching team. In maximum launch rate strikes missiles with a three minute firing time are launched during the three minutes beginning at H-Hour for the attacker and X-Hour for the defender. The exact launch time is determined randomly as indicated in Table 4.10.5. Missiles with firing times of more than three minutes, are launched at X-Hour or H-Hour plus firing time and adjustment shown in Table 4.10.5, minus three minutes.

TABLE 4.10.5

RANDOMIZATION OF MISSILE LAUNCH TIMES IN MAXIMUM LAUNCH-RATE STRIKES

	RANDOM NUMBER GENERATED BY DIRECTING STAFF OR BY COMPUTER			
	00-69	70-79	80-89	90-99
LAUNCH DELAYED FOR:	0 MIN.	1 MIN.	2 MIN.	3 MIN.

12. Soft Time: Some hardened missile systems are "soft" for the last few minutes before launch, and thus highly susceptible to damage by nuclear weapons during that period. The length of this "soft time" is given for such systems in the Weapon System Descriptions in your Team Book. Hardness level during soft time is 2 psi.

13. Tension Alert: A team may declare a tension alert at any time during the crisis phase of the game. If you do so the reaction time of your forces is shortened by six minutes and some of your aircraft which would otherwise not be on alert will assume ground or airborne alert status. If you do not make a public announcement of the assumption of tension alert, the chance that your opponent will discover that you have done so increases

as time passes. The probability that your alert status will be discovered also varies depending on the size and character of your opponent's intelligence systems. The exact probabilities are not announced.

4.11 Command and Control

4.11.1 Defensive Command and Control Centers

The presence of less than three defensive command and control centers in a zone reduces the effectiveness of zonal defenses against aircraft and missiles to the degree indicated in the defensive weapon system descriptions in your Team Book.

4.11.2 Offensive Command and Control Centers

These are of two kinds: Supreme command and control and force command and control. A force command and control center controls only one of the following forces: (1) Bombers, (2) Land-Based missiles, (3) Missile-firing submarines, or (4) Bombardment satellites.

If there are several command and control centers at either the supreme level or one of the force levels, one may substitute for another , so that offensive forces are not affected if at least one center of each kind is intact.

Intra-war negotiations require the survival of at least one supreme offensive command and control center on each side.

Elimination of all command and control centers at either the supreme level or one of the force levels affects response time as indicated in

Table 4.11.2.1:

TABLE 4.11.2.1.

ADDITIONAL DELAY OF LAUNCH AS FUNCTION OF COMMAND AND CONTROL DESTRUCTION		
ADDITIONAL DELAY OF LAUNCH AS FUNCTION OF COMMAND AND CONTROL DESTRUCTION		
DESTRUCTION OF ALL C&C CENTERS:	GROUND ALERT AIRCRAFT ICBM'S AND IRBM'S	SUB-LAUNCHED BALLISTIC MISSILES AND BOMBARDMENT SATELLITES
AT FORCE LEVEL	12 MIN	60 MIN
AT SUPREME LEVEL	30 MIN	30 MIN
AT BOTH LEVELS	60 MIN	24 HOURS

4.12 Nuclear Weapons Effects

4.12.1 Blast Damage

The single-shot kill probability of a weapon against a given target depends on the susceptability of the target to blast damage (hardness), the accuracy and yield of the weapon, whether the weapon is detonated in the air (an air-burst) or low enough that the fireball contacts the ground (a ground-burst) and the accuracy with which the target's location is known. The accuracy and yield of each weapon in Half-SAFE are indicated by the accuracy-yield level (AYL) given for each offensive weapon in the Weapon System Description Sheet in the Planning Data section of your Team Book. Table 4.12.1.1 shows the single-shot kill probabilities for all combinations of target hardness and weapon AYL both for ground bursts (G/B) and air bursts (A/B) at targets whose location is exactly known, known to within six nautical miles (or mobile at a speed of six knots), or mobile at a speed of 12 knots.

TABLE 4.12.1.1

SINGLE-SHOT KILL PROBABILITIES (Pk)																		
	EXACTLY LOCATED TARGETS (FIXED)						APPROXIMATELY LOCATED TARGETS AND 6 KNOT MOBILE TARGETS						12 KNOT MOBILE TARGETS					
	G/B			A/B			G/B			A/B			G/B			A/B		
	HARDNESS (PSI)			HARDNESS (PSI)			HARDNESS (PSI)			HARDNESS (PSI)			HARDNESS (PSI)			HARDNESS (PSI)		
AYL	1000	300	100	7	4	2	1000	300	100	7	4	2	1000	300	100	7	4	2
1	90	99	99	99	99	99	1	2	5	57	90	99	0	1	2	26	52	80
2	75	98	99	99	99	99	1	2	5	57	90	99	0	1	2	26	52	80
3	65	94	99	99	99	99	1	2	5	57	90	99	0	1	2	26	52	80
4	50	82	99	99	99	99	1	2	5	57	90	99	0	1	2	26	52	80
5	35	65	95	99	99	99	1	2	5	57	90	99	0	1	2	26	52	80
6	30	55	90	99	99	99	1	2	5	57	90	99	0	1	2	26	52	80
7	25	50	85	99	99	99	0	2	4	50	83	95	0	0	1	20	46	75
8	15	35	70	99	99	99	0	1	3	37	70	94	0	0	1	14	34	60
9	12	30	60	99	99	99	0	1	2	30	58	85	0	0	1	11	26	50
10	10	20	45	99	99	99	0	0	1	20	43	70	0	0	0	7	17	35
11	5	13	30	99	99	99	0	0	0	13	28	50	0	0	0	4	10	21
12	3	6	15	95	99	99	0	0	0	6	14	28	0	0	0	2	5	10
13	2	5	12	90	99	99	0	0	0	5	12	23	0	0	0	2	4	8
14	2	4	10	85	95	99	0	0	0	4	9	18	0	0	0	1	3	7
15	1	2	6	65	90	99	0	0	0	2	5	10	0	0	0	1	2	4
16	0	1	3	40	70	94	0	0	0	1	3	6	0	0	0	0	1	2

COMPUTATION OF DAMAGE TO CO-LOCATED INSTALLATIONS: Use center table (Approximately Located Targets & 6-Knot Mobile Targets) to find probability of kill for installations co-located with targets whose location is exactly known. Use right-hand table (12-knot Mobile Targets) to find probability of kill for installations co-located with targets whose location is approximately known.

The multiple-shot kill probability is determined by compounding (not adding) the single shot probabilities of kill of each weapon detonated at the target. When attempting to determine the probability that a target will be destroyed remember that no weapon has a 100 percent probability of detonation at its target. To obtain the probability of a target's destruction by a single weapon, that weapon's single-shot kill probability must be degraded by the abort rate of the delivery system, the probability of the delivery vehicle's destruction by defensive systems and the probability of the delivery vehicle's destruction on the ground before launch. These degraded probabilities must be compounded to determine the probability of destruction for more than one weapon.

4.12.2 Deaths

In Half-SAFE people die from two effects of nuclear strikes: prompt effects (blast, shock and prompt radiation), and fall-out.

Prompt effects kill only the urban population. Table 4.12.2.1 shows the percentage of the still-living population of cities of various sizes which would survive the prompt effects of weapons of various yields. Figures are given for ground-bursts (GB) and air bursts (AB), and for the portion of the population in and out of blast shelters.

After the deaths from prompt effects have been calculated, the remaining population of the zone is vulnerable to fall-out resulting from ground bursts within the zone. The number who survive the fall-out depends on the availability of shelters (blast shelters or fall-out shelters) for the population of the zone.

TABLE 4.12.2.1

FRACTION OF CITY POPULATION SURVIVING PROMPT WEAPONS EFFECTS (AB/GB)

YIELD MT	POPULATION								
	T	.5	1	1.5	2—2.5	3—4.5	5—7.5	17.5	
1/20	.5/.4	.6/.5	.7/.6	.75/.7	.8/.75	.85/.8	.9/.85	.95/.9	UNSHELTERED PORTION
1/4	.3/.2	.45/.4	.55/.5	.65/.6	.7/.65	.75/.7	.85/.8	.9/.85	
1/2	.1/0	.3/.25	.4/.35	.5/.45	.6/.55	.65/.6	.8/.75	.85/.8	
1	0	.2/.15	.3/.25	.4/.35	.5/.45	.55/.5	.75/.7	.8/.75	
2	0	.15/.1	.25/.2	.3/.25	.4/.35	.45/.4	.65/.6	.75/.7	
4	0	.1/.05	.2/.15	.25/.2	.3/.25	.35/.3	.55/.5	.7/.65	
8	0	.05/0	.15/.1	.2/.15	.25/.2	.3/.25	.45/.4	.65/.6	
16	0	0	.1/.05	.15/.1	.20/.15	.25/.2	.35/.3	.55/.5	
32	0	0	.05/0	.05/0	.10/.05	.15/.1	.25/.2	.4/.35	
1/20	.75/.64	.84/.75	.91/.84	.94/.91	.96/.94	.98/.96	.99/.98	1.0/.99	SHELTERED PORTION
1/4	.51/.36	.70/.64	.80/.75	.88/.84	.91/.88	.94/.91	.98/.96	.99/.98	
1/2	.19/0	.51/.44	.64/.58	.75/.70	.84/.80	.88/.84	.96/.94	.98/.96	
1	0	.36/.28	.51/.44	.64/.58	.75/.70	.80/.75	.94/.91	.96/.94	
2	0	.28/.19	.44/.36	.51/.44	.64/.58	.70/.64	.88/.84	.94/.91	
4	0	.19/.10	.36/.28	.44/.36	.51/.44	.58/.51	.80/.75	.91/.88	
8	0	.10/0	.28/.19	.36/.28	.44/.36	.51/.44	.70/.64	.88/.84	
16	0	0	.19/.10	.28/.19	.36/.28	.44/.36	.58/.51	.80/.75	
32	0	0	.10/0	.10/0	.19/.10	.28/.19	.44/.36	.64/.58	

NOTE: THIS TABLE SHOWS THE PERCENTAGE OF THE POPULATION OF A CITY WHICH WILL SURVIVE THE DETONATION OF A WEAPON OF THE MEGATONAGE INDICATED. THE "SHELTERED" PORTION OF THE POPULATION IS THAT FRACTION PROTECTED BY BLAST SHELTERS. THE "UNSHELTERED" PORTION REFERS TO THE REMAINDER OF THE POPULATION. THE NUMBER TO LEFT OF THE SLASH IS THE PERCENTAGE OF POPULATION SURVIVING AN AIR BURST, AND THAT TO THE RIGHT IS THE PERCENTAGE SURVIVING A [illegible]

Fall out mortalities are computed as follows: First find the total yield of ground bursts in the zone (Y). The fraction $\left(\frac{Y}{1000}\right)$ of those who survived the prompt effects and were not sheltered, plus the fraction $\left(\frac{Y}{10000}\right)$ of those in shelters, die of fall out.

Total fatalities are obtained by adding fall-out deaths to deaths from prompt effects.

APPENDIX

Population data and identification numbers of urban areas, towns and rural population:

B01 9904 01	New York	17.5
B01 9903 01	Philadelphia	3.5
B01 9902 01	Washington	2.0
B01 9902 02	Baltimore	1.5
B01 9900 01	3 Towns	.5
B01 9100 01	Rural Pop.	2.5
	TOTAL Zone B01:	27.5
B02 9903 01	Boston	3.0
B02 9902 01	Pittsburgh	2.0
B02 9902 02	Buffalo	1.0
B02 9901 01	Rochester	.5
B02 9901 02	Providence	.5
B02 9901 03	New Haven	.5
B02 9900 01	39 Towns	6.5
B02 9100 01	Rural Pop.	9.5
	TOTAL ZONE B02	23.5
B03 9902 01	Atlanta	1.0
B03 9901 01	Miami	.5
B03 9901 02	Richmond	.5
B03 9901 03	Norfolk	.5
B03 9900 01	21 Towns	3.5
B03 9100 01	Rural Pop.	18.0
	TOTAL ZONE B03:	24.0
B04 9903 01	Chicago	7.0
B04 9903 02	Detroit	3.0
B04 9902 01	Cleveland	2.0
B04 9902 02	Indianapolis	1.0
B04 9902 03	Cincinnati	1.0
B04 9902 04	Milwaukee	1.0
B04 9901 01	Toledo	.5
B04 9901 02	Akron	.5
B04 9901 03	Youngstown	.5
B04 9901 04	Columbus	.5
B04 9901 05	Dayton	.5
B04 9900 01	30 Towns	5.0
B04 9100 01	Rural Pop.	17.0
	TOTAL ZONE B04:	39.5
B05 9902 01	Birmingham	1.0
B05 9901 01	Louisville	.5
B05 9900 01	12 Towns	2.0
B05 9100 01	Rural Pop.	9.5
	TOTAL ZONE B05	13.0
B06 9902 01	Minneapolis	1.5
B06 9100 01	Rural Pop.	4.0
	TOTAL ZONE B06	5.5
B07 9902 01	St. Louis	1.5
B07 9902 02	Kansas City	1.0
B07 9901 01	Omaha	.5
B07 9900 01	12 Towns	2.0
B07 9100 01	Rural Pop.	6.5
	TOTAL ZONE B07	11.5
B08 9902 01	Houston	1.0
B08 9902 02	New Orleans	1.0
B08 9901 01	Oklahoma City	.5
B08 9901 02	Fort Worth	.5
B08 9901 03	Dallas	.5
B08 9901 04	San Antonio	.5
B08 9900 01	12 Towns	2.0
B08 9100 01	Rural Pop.	12.5
	TOTAL ZONE B08	18.5
B09 9100 01	Rural Pop.	2.0
	TOTAL ZONE B09	2.0
B10 9910 01	Denver	.5
B10 9901 02	Salt Lake City	.5
B10 9900 01	3 Towns	.5
B10 9100 01	Rural Pop.	4.0
	TOTAL ZONE B10	5.5
B11 9902 01	Seattle	1.0
B11 9902 02	Portland	1.0
B11 9900 01	3 Towns	.5
B11 9100 01	Rural Pop.	3.0
	TOTAL ZONE B11	5.5
B12 9903 01	Los Angeles	7.5
B12 9903 02	San Francisco	3.0
B12 9902 01	San Diego	1.0
B12 9901 01	Sacramento	.5
B12 9900 01	9 Towns	1.5
B12 9100 01	Rural Pop.	4.5
	TOTAL ZONE B12	18.0

B13 9100 01	Rural Pop.	.5
	TOTAL ZONE B13	.5
B14 9902 01	Vancouver	1.0
B14 9901 01	Winnipeg	.5
B14 9901 02	Edmonton	.5
B14 9900 01	3 Towns	.5
B14 9100 01	Rural Pop.	2.5
	TOTAL ZONE B14	5.0
B15 9902 01	Toronto	2.0
B15 9901 01	Hamilton	.5
B15 9901 02	Ottawa	.5
B15 9900 01	4 Towns	.5
B15 9100 01	Rural Pop.	4.5
	TOTAL ZONE B15	8.0
B16 9902 01	Montreal	2.0
B16 9900 01	4 Towns	.5
B16 9100 01	Rural Pop.	4.5
	TOTAL ZONE B16	7.0
	TOTAL ZONE B17	0.0
B18 9902 01	Istanbul	2.0
B18 9902 02	Ankara	1.0
B18 9902 03	Izmir	1.0
B18 9900 01	4 Towns	1.0
B18 9100 01	Rural Pop.	32.5
	TOTAL ZONE B18	37.5
B19 9904 01	Tokyo	13.0
B19 9903 01	Osaka	3.5
B19 9902 01	Nagoya	2.0
B19 9902 02	Kyoto	1.5
B19 9902 03	Kobe	1.5
B19 9902 04	Kawasaki	1.0
B19 9902 05	Sapporo	1.0
B19 9901 01	Amagasaki	.5
B19 9901 02	Fukuoka	.5
B19 9901 03	Hiroshima	.5
B19 9901 04	Nagasaki	.5
B19 9901 05	Sendai	.5
B19 9900 01	6 Towns	3.0
B19 9100 01	Rural Pop.	70.0
	TOTAL ZONE B19:	99.0

B20 9902 01	Vienna	2.0
B20 9902 02	Antwerp	1.0
B20 9902 03	Brussels	1.5
B20 9901 01	Charleroi	.5
B20 9901 02	Ghent	.5
B20 9901 03	Liege	.5
B20 9902 04	Copenhagen	1.5
B20 9902 05	Marseilles	1.0
B20 9903 01	Paris	7.5
B20 9901 04	Lyons	.5
B20 9902 06	Cologne	1.0
B20 9902 07	Dortmund	1.0
B20 9902 08	Dusseldorf	1.0
B20 9902 09	Essen	1.0
B20 9902 10	Frankfurt	1.0
B20 9902 11	Hamburg	2.5
B20 9902 12	Hanover	1.0
B20 9902 13	Munich	1.5
B20 9902 14	Stuttgart	1.0
B20 9901 05	Bochum	.5
B20 9901 06	Bremen	.5
B20 9901 07	Duisburg	.5
B20 9901 08	Gelsenkirchen	.5
B20 9901 09	Mannheim	.5
B20 9901 10	Nurnburg	.5
B20 9901 11	Wuppertal	.5
B20 9902 15	Genoa	1.0
B20 9902 16	Milan	1.5
B20 9902 17	Naples	1.5
B20 9902 18	Palermo	1.0
B20 9902 19	Rome	2.5
B20 9902 20	Turin	1.0
B20 9901 12	Bari	.5
B20 9901 13	Bologna	.5
B20 9901 14	Cantania	.5
B20 9901 15	Florence	.5
B20 9901 16	Venice	.5
B20 9902 21	Amsterdam	1.5
B20 9902 22	The Hague	1.0
B20 9902 23	Rotterdam	1.0
B20 9902 24	Lisbon	1.0
B20 9902 25	Barcelona	2.0
B20 9902 26	Madrid	2.5
B20 9901 27	Valencia	1.0
B20 9901 17	Malaga	.5
B20 9901 18	Seville	.5
B20 9901 19	Zaragoza	.5
B20 9901 28	Birmingham	1.5
B20 9902 29	Leeds	1.0
B20 9902 30	Liverpool	1.0
B20 9904 01	London	9.0

B20 9902 31	Manchester	1.0
B20 9902 32	Sheffield	1.0
B20 9902 33	Edinburgh	1.0
B20 9902 34	Glasgow	1.5
B20 9900 01	70 Towns	14.0
B20 9100 01	Rural Pop.	205.5
	TOTAL ZONE B20:	290.0

R01 9903 01	Leningrad	3.5
R01 9901 01	Riga	.5
R01 9900 01	9 Towns	1.5
R01 9100 01	Rural Pop.	6.0
	TOTAL ZONE R01:	11.5

R02 9901 01	Minsk	.5
R02 9900 01	15 Towns	2.5
R02 9100 01	Rural Pop.	16.0
	TOTAL ZONE R02:	19.0

R03 9903 01	Moscow	6.5
R03 9900 01	9 Towns	1.5
R03 9100 01	Rural Pop.	4.5
	TOTAL ZONE R03:	12.5

R04 9902 01	Gorkiy	1.0
R04 9901 01	Kazan	.5
R04 9901 02	Ivanovo	.5
R04 9901 03	Yaroslavl	.5
R04 9900 01	15 Towns	2.5
R04 9100 01	Rural Pop.	12.5
	TOTAL ZONE R04:	17.5

R05 9902 01	Kuybyshev	1.0
R05 9901 01	Saratov	.5
R05 9901 02	Tula	.5
R05 9900 01	15 Towns	2.5
R05 9100 01	Rural Pop.	10.0
	TOTAL ZONE R05:	14.5

R06 9902 01	Kiyev	1.5
R06 9902 02	Kharkov	1.0
R06 9902 03	Dnepropetrovsk	1.0
R06 9902 04	Stalino	1.0
R06 9901 01	Lvov	.5
R06 9901 02	Krivoy Rog	.5
R06 9901 03	Voronezh	.5
R06 9901 04	Zaporozhe	.5
R06 9901 05	Gorlovka	.5
R06 9901 06	Makeyevka	.5
R06 9901 07	Rostov	.5
R06 9901 08	Volgograd	.5
R06 9901 09	Astrakhan	.5
R06 9900 01	21 Towns	3.5
R06 9100 01	Rural Pop.	34.0
	TOTAL ZONE R06:	46.5

R07 9902 01	Odessa	1.0
R07 9902 02	Tbilisi	1.0
R07 9902 03	Baku	1.0
R07 9901 01	Yerevan	.5
R07 9901 02	Krasnodar	.5
R07 9900 01	18 Towns	3.0
R07 9100 01	Rural Pop.	20.5
	TOTAL ZONE R07:	27.5

R08 9900 01	6 Towns	1.9
R08 9100 01	Rural Pop.	3.5
	TOTAL ZONE R08:	4.5

R09 9902 01	Perm	1.0
R09 9902 02	Sverdlovsk	1.0
R09 9902 03	Chelyabirsk	1.0
R09 9902 04	Ufa	1.0
R09 9901 01	Nizhnitagil	.5
R09 9901 02	Magnitogorsk	.5
R09 9901 03	Chkalov	.5
R09 9900 01	12 Towns	2.0
R09 9100 01	Rural Pop.	14.0
	TOTAL ZONE R09:	21.5

R10 9902 01	Tashkent	1.5
R10 9901 01	Alma Ata	.5
R10 9901 02	Karaganda	.5
R10 9900 01	18 Towns	3.0
R10 9100 01	Rural Pop.	21.0
	TOTAL ZONE R10:	26.5

R11 9900 01	3 Towns	.5
R11 9100 01	Rural Pop.	1.0
	TOTAL ZONE R11:	1.5

R12 9902 01	Omsk	1.0
R12 9902 02	Novosibirsk	1.0
R12 9901 01	Kemerovo	.5
R12 9901 02	Prokopyevsk	.5
R12 9901 03	Barngul	.5
R12 9901 04	Stalinsk	.5
R12 9900 01	9 Towns	1.5
R12 9100 01	Rural Pop.	9.0
	TOTAL ZONE R12:	14.5

R13 9901 01	Irkutsk	.5
R13 9901 02	Krasnoyarsk	.5
R13 9900 01	6 Towns	1.0
R13 9100 01	Rural Pop.	7.0
	TOTAL ZONE R13:	9.0

R14 9901 01	Khabarovsk	.5
R14 9901 02	Vladivostok	.5
R14 9900 01	3 Towns	.5
R14 9100 01	Rural Pop.	2.0
	TOTAL ZONE R14:	3.5

R15	9902	01	Berlin	2.0
R15	9901	01	Dresden	.5
R15	9902	02	Leipzig	1.0
R15	9902	03	Warsaw	2.0
R15	9901	02	Wroclaw	.5
R15	9902	04	Lodz	1.0
R15	9901	03	Krakow	.5
R15	9901	04	Poznan	.5
R15	9902	05	Prague	1.5
R15	9900	01	14 Towns	3.5
R15	9100	01	Rural Pop.	51.5
			TOTAL ZONE R15:	64.5
R16	9902	01	Bucharest	2.0
R16	9902	02	Budapest	2.5
R16	9902	03	Belgrade	1.0
R16	9901	01	Zagreb	.5
R16	9900	01	13 Towns	2.0
R16	9100	01	Rural Pop.	63.0
			TOTAL ZONE R16:	71.0
R17	9901	01	Changchun	.5
R17	9902	01	Harbin	1.0
R17	9903	01	Mukden	3.5
R17	9903	02	Peking	5.0
R17	9902	02	Siking	1.0
R17	9903	03	Tientsin	3.5
R17	9902	03	Tsinan	1.0
R17	9902	04	Tsingtao	1.0
R17	9902	05	Dairen	1.5
R17	9902	06	Chengtu	1.0
R17	9900	01	21 Towns	4.5
R17	9100	01	Rural Pop.	326.5
			TOTAL ZONE R17:	350.0
R18	9901	01	Chungking	.5
R18	9902	01	Hangchow	1.0
R18	9902	02	Hankow	1.0
R18	9902	03	Nanking	1.5
R18	9903	01	Shanghai	7.5
R18	9901	02	Canton	.5
R18	9901	03	Chengtu	.5
R18	9901	04	Kunming	.5
R18	9901	05	Minhow	.5
R18	9901	06	Tungshan	.5
R18	9900	07	Wuhsien	.5
R18	9900	01	38 Towns	8.0
R18	9100	01	Rural Pop.	326.0
			TOTAL ZONE R18:	348.5

System codes of urban areas and rural population:

System Number	Description
9100	Rural population
9900	Towns (population less than .5 million).
9901	Urban area, .5 million population.
9902	Urban area, population 1.0 through 2.5 million.
9903	Urban area, population 3.0 through 7.5 million.
9904	Urban area, population 8.0 million or more.

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